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ERRATA.

Page 27	line 16	for "**d'naophèles**"	read "**d'anophèles**"
,, 41	,, 19	,, "**19**"	read "**18**"
,, 90	,, 15	,, "*wolffhuegli*"	read "*wolffhuegeli*"
,, 106	,, 27	,, "*Ladrodectus*"	read "*Latrodectus*"
,, 108	,, 23	,, "Hacket"	read "Hackett"
,, 140	,, 5	,, "infected"	read "infested"
,, 188	,, 36	,, "paper"	read "page"
,, 188	,, 46	,, "p. 000"	read "p. 189"
,, 192	,, 4	,, "344"	read "343"
,, 196	6 lines from end	for "GAISAS"	read "BAISAS"
,, 201	line 24	for "JACK (R. V.)"	read "JACK (R. W.)"
,, 221	,, 21	,, "*turicatae*"	read "*turicata*"

IMPERIAL INSTITUTE OF ENTOMOLOGY.

REVIEW

OF

APPLIED ENTOMOLOGY.

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[GALUZO (I. G.).] **Галузо (И. Г.). Some protozoan Diseases of domestic Animals in Armenia.** [*In Russian.*]—*Zakavkazsk. parasit. Eksped. v Armeniyu 1931 g.* [*Transcaucas. parasit. Exped. Armenia 1931*] in *Trud. Sov. Izuch. proizv. Sil*, Ser. Zakavkaz. [*Trans. Coun. Study industr. Resources*, Ser. Transcaucas.] pt. 11 pp. 29–47, 1 graph, 2 figs., 1 ref. Leningrad, Acad. Sci., 1934.

Details are given of investigations in June–July 1931 on the incidence of the form of piroplasmosis caused by *Theileria annulata* in cattle in various parts of the Armenian Republic and on its treatment by drugs. Experiments and field observations in 1928–29 showed that in Central Asia *T. annulata* is transmitted by *Hyalomma dromedarii asiaticum*, P. Schl. & E. Schl., and though this species was not found in Armenia in 1931, all the ticks collected in a locality where an epizootic of the disease occurred belonged to the genus *Hyalomma*. Suggestions are made for the construction of special cattle sheds, the arrangement of the yards of dairy farms and the organisation of the work in them so as to minimise the possibility of infestation by ticks.

[PAVLOVSKIĬ (E. N.) & POMERANTZEV (B. I.).] **Павловский (Е. Н.) и Померанцев (Б. И.). Contribution to the Question of the Distribution of Ticks in the Zone of Pastures on the Western Slope of Alagez.** [*In Russian.*]—*Zakavkazsk. parasit. Eksped. v Armeniyu 1931 g.* [*Transcaucas. parasit. Exped. Armenia 1931*] in *Trud. Sov. Izuch. proizv. Sil*, Ser. Zakavkaz. [*Trans. Coun. Study industr. Resources*, Ser. Transcaucas.], pt. 11 pp. 49–62, 2 graphs, 3 figs., 2 refs. Leningrad, Acad. Sci., 1934.

In May–July 1931 *Rhipicephalus bursa*, C. & F., was found in the central part of the Armenian Republic infesting the winter pastures of a large sheep farm, where sheep are usually allowed to graze from November till June. The adults appear at the beginning of June and attack sheep, cattle and horses, causing cases of piroplasmosis ; about

the end of July, however, they greatly decrease in numbers. Larvae and nymphs were found on cattle and to a less extent on horses, but not on sheep. Other species present were *Hyalomma marginatum*, Koch, *H. dromedarii*, Neum., *H. savignyi armeniorum*, P. Schl., *Haemaphysalis cholodkovskii*, Olen., *H. cinnabarina punctata*, C. & F., *H. sulcata*, C. & F., and *Dermacentor silvarum*, Olen.

In June the sheep are driven for over 40 miles to summer pastures, where they usually remain till November. These pastures are naturally free from ticks, and the sheep lose almost all their ticks on the way to them and are no longer infested a few days after they arrive. Those infected with piroplasmosis must consequently have contracted it on the winter pastures. They should therefore be removed from the winter pastures before the adults of *R. bursa* begin to attack them about 20th May. Other measures commonly employed against ticks that might be adopted on this farm are discussed.

[Pomerantzev (B. I.).] **Померанцев (Б. И.). Preliminary Data on the Ecology of the Ticks Ixodidae in the Valley of Arax.** [*In Russian.*] —*Zakavkazsk. parasit. Eksped. v Armeniyu 1931 g.* [*Transcaucas. parasit. Exped. Armenia 1931*] in *Trud. Sov. Izuch. proizv. Sil*, Ser. Zakavkaz. [*Trans. Coun. Study industr. Resources*, Ser. Transcaucas.], pt. 11 pp. 63–66, 1 fig. Leningrad, Acad. Sci., 1934.

Ticks found in south-western Armenia on mountain grass-land that it is proposed to use as pasture were *Haemaphysalis cholodkovskii*, Olen., *Rhipicephalus bursa*, C. & F., and various species of *Hyalomma*, *H. marginatum*, Koch, and *H. dromedarii*, Neum., occurring in pastures of the *Artemisia* semi-desert type, and *H. savignyi armeniorum*, P. Schl., and *H. detritum rubrum*, P. Schl. & Olen., only in those of the saline marshy type. With the exception of *R. bursa*, the immature stages of all these ticks were taken on reptiles and wild birds.

In villages in the valley of the river Arax, *Ornithodorus lahorensis*, Neum., was found in inhabited houses and animal quarters, and *Argas persicus*, Oken, was common in fowl houses. A larva of *Rhipicephalus sanguineus*, Latr., was taken on a domestic mouse.

[Lototzkiĭ (B. V.) & Popov (V. V.).] **Лотоцкий (Б. В.) и Попов (В. В.). Contribution to the Fauna and Ecology of the Blood-sucking Ticks of the Family Ixodidae in the north-eastern Region of Armenia.** [*In Russian.*]—*Zakavkazsk. parasit. Eksped. v Armeniyu 1931 g.* [*Transcaucas. parasit. Exped. Armenia 1931*] in *Trud. Sov. Izuch. proizv. Sil*, Ser. Zakavkaz. [*Trans. Coun. Study industr. Resources*, Ser. Transcaucas.], pt. 11 pp. 67–80. Leningrad, Acad. Sci., 1934.

Descriptions are given of the topography of the country and the character of the pastures in a mountainous region at an altitude of over 6,500 ft. in north-eastern Armenia. In investigations during June–July 1931 no ticks were taken in sweepings made in the field, but adults occurred on domestic animals. The species were *Rhipicephalus bursa*, C. & F., chiefly on sheep and goats, and also on cattle and horses ; *R. sanguineus*, Latr., on sheep and cattle ; *Dermacentor niveus*, Neum., in negligible numbers on pigs ; *Ixodes ricinus*, L. (one individual) on a goat ; *Hyalomma marginatum*, Koch, on cattle, buffaloes, pigs and

sheep; and *H. savignyi armeniorum*, P. Schl., on cattle. A table shows the ticks and their hosts, the date and place of capture, the part of the body infested, and the average number of ticks per host.

[Burakova (L. V.) & Mirzayan (A. A.).] **Буракова (Л. В.) и Мирзаян (А. А.). Investigations on the Places of the Mass Breeding of Sandflies (*Phlebotomus*) and a few Data on their Fauna in Armenia.** [*In Russian.*]—*Zakavkazsk. parasit. Eksped. v Armeniyu 1931 g.* [*Transcaucas. parasit. Exped. Armenia 1931*] in *Trud. Sov. Izuch. proizv. Sil*, Ser. Zakavkaz. [*Trans. Coun. Study industr. Resources*, Ser. Transcaucas.], pt. 11 pp. 81–91, 3 figs., 1 ref. Leningrad, Acad. Sci., 1934.

An account is given of investigations on sandflies in and near the town of Erivan in Armenia during 1931. The first cases of sand-fly fever were recorded in the second half of June. To trap the sand-flies, fly-papers were placed in the local hospital, adjoining outhouses, several latrines and two fowl-houses, and muslin bags were fixed over openings in doors and roofs. Of the total number of sand-flies thus taken, 5,843 were females and 7,072 males. The identification of the latter by the structure of the genitalia showed that 96·9 per cent. were *Phlebotomus papatasii*, Scop., other species being *P. caucasicus*, Marz., and *P. chinensis*, Newst., and, in negligible numbers, *P. kandelakii*, Shchurenkova, *P. major*, Annan., *P. pirumowi*, sp. n., and species of the group of *P. minutus*, Rond. Very few sand-flies occurred in the hospital, outhouses or latrines, but large numbers congregated on the walls of the fowl-houses, especially in cracks and corners. These fowl-houses were built of rough stones and clay and had earthern floors covered with a thick layer of droppings, straw and feathers. They were presumably the breeding-places of the sand-flies, since thousands were caught at night on their way out through an opening in the door and only negligible numbers on their way in.

Under laboratory conditions, 65·3 per cent. of the females oviposited, doing so within 6–12 days after a blood meal. The average number of eggs laid was 21·8, the maximum being 70. Almost all of them laid their eggs in one batch, dying on the same day. The egg stage lasted 5–16 days (59·6 per cent. of the eggs hatching), the larval stage 26–27 days, and the pupal 7–18. The larvae were reared in slightly moistened rabbit faeces at a temperature of 24–26°C. [75·2–78·8°F.]. In one of the breeding cages, larvae that were fully grown and active on 1st October hibernated and were still healthy in the following April.

MacDougall (R. S.). **Ox Warble Flies.**—*Trans. Highl. agric. Soc. Scot.* 1934 reprint 90 pp., 32 figs., many refs. Edinburgh, 1934.

The author gives an account of the bionomics and control of Oestrids, particularly *Hypoderma bovis*, DeG., and *H. lineatum*, Vill., on cattle in Scotland, taken from the literature and from his own observations [*R.A.E.*, B **19** 21, 89; **20** 47]. In view of reports that cattle on farms in the neighbourhood of deer forests owed their warble infestation to the deer warble-fly, two experiments were carried out in 1933 in which larvae of *Hypoderma diana*, Brauer, from the hides of deer were introduced beneath the skin of two calves on the side of the dewlap. Although the wounds healed satisfactorily, there was no evidence of migration of the larvae and no swellings appeared later in the back.

Further experiments on dressings for the treatment of warbles were undertaken in 1933. Unsatisfactory results were obtained with a 20 per cent. alcoholic extract of pyrethrum, diluted with equal parts of water and applied with a cloth or syringe, but rather better results were obtained in two experiments using respectively ¼ and ½ lb. powdered cubé root (*Lonchocarpus*) in 1 gal. water applied with a cloth. Bovidera or Hypoderma oil, a dressing greatly favoured in Denmark [**20** 178] was again tested [*cf.* **16** 256]; it was found to be an effective larvicide, particularly against the younger larvae.

HIXSON (H.). **The Life History and Habits of *Ixodes sculptus* Neumann (Ixodidae).**—*Iowa St. Coll. J. Sci.* **7** no. 1 pp. 35–42, 3 figs., 6 refs. Ames, Iowa, 1932. [Recd. November 1934.]

Investigations on the bionomics of *Ixodes sculptus*, Neum., of which little was previously known, were carried out in the laboratory, some observations made in the field in Iowa being used to verify and supplement the conclusions. All stages, including both sexes of the adult, are described. The known distribution of this tick is restricted to the United States, where it occurs on small rodents. Details are given of the technique used and of the observations on each stage at different temperatures. All stages are adapted to life in burrows. Engorged forms leave the host at night and burrow into the litter for moulting or oviposition. The adult male is not parasitic but remains in the litter and pairs either before or after the engorgement of the female.

Oviposition usually began about 6 days after engorgement and continued for 26–29 days, the maximum number of eggs laid by a single female being 1,006. At 24·5°C. [75·2°F.], the eggs hatched in about 34 days. At the same temperature the maximum life of an unengorged larva was 166 days. Under normal conditions, larvae dropped from their host 3–9 days after attachment, became quiescent in about 4 days and moulted about 9–12 days later. The maximum longevity of an unengorged nymph was 118 days, but it is probably capable of surviving much longer. The nymphs engorged in 4–9 days and at 75·2°F. became quiescent in 3–7 days, the males moulting 11–12 days later and the females 12–13. All stages of the tick may be found at any time during the year.

BODENHEIMER (F. S.). **Ecological Studies on some Ticks.**—*Parasitology* **26** no. 4 pp. 489–495, 3 figs., 4 refs. Cambridge, 9th November 1934.

Ticks in the larval and adult stages show great resistance to the influences of climate and hunger, and the investigations described were undertaken with a view to determining whether the eggs or unfed first instar larvae are more susceptible. The ticks used were *Ornithodorus coniceps*, Can., a fowl tick that in Palestine is restricted to the hill country, *Argas persicus*, Oken, a fowl tick that occurs mainly in the lowlands, and *Hyalomma aegyptium*, L., which is widely distributed, even in the desert. The temperatures studied ranged from 7 to 40°C. [44·6 to 104°F.] and the relative humidities from 20 to 100 per cent. In each case, the shortest incubation period and the percentage of eggs hatching at different combinations of temperature and humidity were determined, as well as the degree of activity that occurred in various

stages at increasing temperatures (scale of experimental activity). The mean longevity of newly hatched larvae at different temperatures and humidities was ascertained for *Ornithodorus* only.

The results show that the eggs and young larvae of *Ornithodorus* require a high atmospheric humidity. This species can resist fairly low winter temperatures, but its development threshold is somewhat higher (10·2°C. [50·36°F.]) than those of the other two. The vital optimum (28°C. [82·4°F.] for the egg and 24°C. [75·2°F.] for the newly hatched larva) does not agree very well with the macroclimate of the Mediterranean region, but is compatible with the microclimate of its environment in Palestine. The low thermal death point (45·5°C. [113·9°F.] for adults) corresponds to the nocturnal habits of this tick. *Argas*, which is widely distributed in tropical and sub-tropical countries, is very resistant to climatic influences, and mortality in the egg or early larval stages due to these causes cannot be considered as a limiting factor. The vital optimum for the egg is 20°C. [68°F.] (or possibly a higher temperature) at 80 per cent. relative humidity. The influence of combined climatic factors is unusually low. The extreme range of activity (from the torpor induced by cold to the paralysis caused by heat) is much greater in *Argas* and *Hyalomma* (45°C. [81°F.]) than in *Ornithodorus* (37°C. [66·6°F.]), thus coinciding with the wide daily range of temperatures in steppes and deserts. The higher thermal death point in *Hyalomma* (51·7°C. [125·06°F.]) than in *Argas* (47·7°C. [117·86°F.]) or *Ornithodorus* corresponds to its diurnal habits. It is less tolerant to low humidity than *Argas*, the vital optimum for the egg being 30°C. [86°F.] at 90 per cent. relative humidity. In addition to climatic factors, the accessibility of the host is of primary importance in regulating the fluctuations in tick populations, and many observations appear to show that larvae and nymphs are active in searching for hosts. Even in the desert, resting mammals soon form a centre of invasion for ticks from an area of unknown size.

It is concluded that in Palestine development in *Ornithodorus* is very slow in winter and is interrupted for some time. The eggs can only develop in the humid spring ; at all other seasons, except in special microclimates, 100 per cent. would die. The other species develop successfully in all stages from spring to autumn.

Daubney (R.) & Hudson (J. R.). **Nairobi Sheep Disease : Natural and Experimental Transmission by Ticks other than** *Rhipicephalus appendiculatus*.—*Parasitology* **26** no. 4 pp. 496–509, 3 charts, 7 refs. Cambridge, 9th November 1934.

Several outbreaks of Nairobi sheep disease resulting in a heavy mortality occurred in 1931 in two areas of Kenya 120 miles apart, in both of which the normal vector, *Rhipicephalus appendiculatus*, Neum. [*cf. R.A.E.*, B **20** 20] was absent. The usual measures, thorough hand-dressing with tobacco extract suspended in crude oil and movement of sheep to fresh pastures where possible, proved completely successful in controlling the spread of the disease. Experiments to determine the vector were undertaken with ticks common to the two areas, namely *R. simus*, Koch, *R. evertsi*, Neum., *R. pulchellus*, Gerst., and *Amblyomma variegatum*, F. The infection was transmitted only by nymphs of *A. variegatum* fed as larvae and adults fed as nymphs, no attempts at hereditary transmission having yet been successful. The tests with the first two of the species of *Rhipicephalus* are considered to have been

sufficiently exhaustive to justify the conclusion that they are unable to act as vectors. The wide distribution of *R. pulchellus* in areas where Nairobi sheep disease is absent or extremely rare suggested that it was unlikely to be a vector, and a few tests made with different stages confirmed this view. In one case transmission was effected by a female of *Rhipicephalus bursa*, C. & F., taken as a nymph from an infected sheep, but attempts to induce larvae to engorge on the ears of sheep and lambs were unsuccessful, and adults reared as nymphs on an infected sheep failed to transmit the disease. This tick was only found in one of the infected areas, and as only the nymphs and adults feed on sheep, it can only be a relatively inefficient vector. *Hyalomma aegyptium*, Koch, occurred in one of the areas, but attempts to feed its larvae on the ears of sheep were unsuccessful.

As a greater proportion of failures to transmit infection was noted in experiments with *A. variegatum* than is usual in experiments with *R. appendiculatus*, it is probable that the former is a less efficient vector than the latter. This may account for the impression that in the outbreaks investigated there was less tendency for the disease to spread rapidly and that the lesions in individual cases were less acute ; it may also partly explain why there are extensive areas heavily infested with *A. variegatum* where the disease is rare or absent. Moreover, the larval and nymphal stages of *A. variegatum* are less often found on domestic stock, particularly sheep, than those of *R. appendiculatus*.

TATE (P.) & VINCENT (M.). **The Susceptibility of Autogenous and Anautogenous Races of** *Culex pipiens* **to Infection with Avian Malaria** (*Plasmodium relictum*).—*Parasitology* **26** no. 4 pp. 512–522, 18 refs. Cambridge, 9th November 1934.

The following is largely taken from the authors' summary: An anautogenous English strain and autogenous Greek, Hungarian, Maltese and cross-bred strains of *Culex pipiens*, L., were infected with an Algerian and a German strain of *Plasmodium praecox* (*relictum*). The behaviour of the different mosquito strains was similar as regards susceptibility and transmission when the same strain of *P. praecox* was used, but about 89 per cent. of the mosquitos became infected with the Algerian strain as compared with about 43 per cent. with the German, and the infection was heavier in the former case. The results also indicate that this difference in the infection rates of the two strains is not due merely to differences in the number of gametocytes formed. Mosquitos were infected in some cases by feeding on birds with chronic infections of the Algerian strain, but not when fed on birds with chronic infections of the German strain. The infection of *C. pipiens* by *P. praecox* did not appear to be affected by the season of the year. The Algerian strain was successfully transmitted by the English, Greek, Maltese, Hungarian and Greek-Hungarian strains of *C. pipiens* and the German strain by the first three and the Greek-English strains.

[KHODUKIN (N. I.) & SOFIEV (M. S.).] **Ходукин (Н. И.) и Софиев (М. С.). On the Rôle of** *Ornithodorus lahorensis* **in the Transmission of Central-Asiatic Relapsing Fever.** [*In Russian.*]—*Za sotz. Zdravookhran. Uzbek.* [*Social. Hlth Prot. Uzbek.*] **11** no. 6–7 pp. 63–65. Tashkent, 1932. [Recd. November 1934.]

Work on the transmission by *Ornithodorus* spp. of *Spirochaeta sogdiana*, the causal organism of the form of relapsing fever that occurs

in Russian Central Asia, is briefly reviewed from the literature [*R.A.E.*, B **18** 7; **21** 97, etc.]. The fact that it is experimentally transmissible by the African tick, *O. moubata*, Murr. [**17** 18] was confirmed by the authors. Other experiments demonstrated that ticks become infected with spirochaetes irrespective of whether the species is capable of transmitting the disease or not [**19** 53]; *S. sogdiana* was present in *O. lahorensis*, Neum., for as long as 80 days, though in no stage was this tick infective by its bite. Inoculations of guineapigs with its coxal fluid also gave negative results. In experiments with the same species of tick to determine whether the infection can be inherited, larvae that were the offspring of infected adults refused to feed on laboratory animals or man for 9 months after hatching in September; in July a few were induced to feed on man, but no infection was produced. Injections of suspensions of eggs or larvae into guineapigs also gave negative results.

The authors conclude, therefore, that the only established vector of relapsing fever in Central Asia is *O. papillipes*, Bir.

[GUTZEVICH (A. V.).] **Гуцевич (А. В.). An Attempt to compose a Calendar of the Life of the Malaria Mosquito** (*Anopheles maculipennis* **Mgn.) for different Regions of the U.S.S.R.** [*In Russian.*]—*Za sotz. Zdravookhran. Uzbek.* [*Social. Hlth Prot. Uzbek.*] **11** no. 6–7 pp. 66–82. Tashkent, 1932. [Recd. November 1934.]

Data from the literature are correlated to indicate the temperature conditions on which depend the seasonal occurrence in the Russian Union of *Anopheles maculipennis*, Mg. The findings are also considered applicable to *A. sacharovi*, Favr, which is regarded as a subspecies of it. The duration of development of the first generation of *A. maculipennis* is about the same in the northern, central and southern areas of the Union, the larval and pupal stages covering an average period of 26 days. In spring, most of the females begin to abandon their hibernation quarters at a mean temperature of 5–7°C. [41–44·6°F.], oviposition starts at 7–9°C. [44·6–48·2°F.], the first larvae appear at 9–11°C. [48·2–51·8°F.], and the first young adults at 14–16·5°C. [57·2–61·7°F.]. In autumn, the mosquitos begin to enter their hibernation quarters when the temperature drops to 10–7°C. [50–44·6°F.]. Though in some parts of Central Russia adults have emerged as late as the second half of October, usually no emergence takes place at temperatures below 7–8°C. [44·6–46·4°F.]. The number of annual generations may be reckoned as 2 in the north of the Russian Union, 3–4 in the centre, and 5–6 in the south.

Measures against the larvae should begin when the first generation reaches the fourth instar, which in European Russia occurs at a mean temperature of 12–14°C. [53·6–57·2°F.] and in Asiatic Russia at 13–15°C. [55·4–59°F.]. In autumn they should be discontinued when the temperature falls to 10°C., as if larvae hatch later, they will not complete their development.

[PERFIL'EV (P.).] **Перфильев (П.). A few Data on the comparative Anatomy of Mosquitos.** [*In Russian.*]—*Za sotz. Zdravookhran. Uzbek.* [*Social. Hlth Prot. Uzbek.*] **11** no. 6–7 pp. 83–90, 4 pls. Tashkent, 1932. [Recd. November 1934.]

This continuation of a paper already noticed [*R.A.E.*, B **19** 230] deals with the structure of the male and female genitalia and salivary

glands of *Aëdes cinereus*, Mg., *A. communis*, DeG., *A. vexans*, Mg., *A. diantaeus*, H. D. & K., *A. punctor*, Kby. (*meigenanus*, Dyar), *A. maculatus*, Mg., *A. intrudens*, Dyar, *A. pulchritarsis*, Rond., *A.* (*Stegomyia*) *argenteus*, Poir., *A.* (*Finlaya*) *geniculatus*, Ol., *Culex pipiens*, L., and *Theobaldia alaskaensis*, Ludl.

HUSAMETTIN (—). **Malaria Control in Turkey.**—*Quart. Bull. Hlth Org. L.o.N.* **3** no. 1 pp. 129–152, 1 map. Geneva, March 1934. [Recd. November 1934.]

After dealing briefly with the influence of the topography and climate of Turkey on the incidence of malaria, the author gives the substance of the legislation concerned with the control of the disease, together with the history and present organisation of control measures in the eleven areas where anti-malaria campaigns are being carried out [*cf. R.A.E.*, B **20** 74]. Short notes on the Anophelines are included [*cf.* **16** 175; **22** 121]. The employment of Paris green as a larvicide, begun in certain areas in 1927, has now become general [*cf.* **19** 180], and use is being made of several species of larvicidal fish. Each campaign area now possesses a mobile motor pump with between 150 and 220 yards of piping, which is used for draining collections of rain water by pumping it on to permeable soil. The spleen and parasite rates and the percentages of the different malaria parasites in the positive blood tests during 1929–32 for the 10 largest campaign areas are shown in a table. The districts rendered healthy by the campaigns are excluded from the area and new malarious localities are dealt with each year.

THORNTON (E. N.). **Malaria.**—*Rep. Dep. publ. Hlth S. Afr. 1933–34* pp. 45–58. Pretoria, 1934.

A very detailed account is given of the organisation and execution of control measures against malaria undertaken in the Union of South Africa [*cf. R.A.E.*, B **22** 53]. In Natal and Zululand the weather was exceptionally wet and humid in 1933–34, and the warm weather persisted for a month longer than usual, but in spite of the conditions in general being far more favourable for an epidemic of malaria than at the time of the outbreak in 1931–32, no such outbreak occurred. *Anopheles gambiae*, Giles, bred in large numbers, and the fact that there was less fever than was expected can only be attributed to the increased knowledge of malaria control acquired by the whole population south of the Umfolosi. The satisfactory working of the European Malaria Committees in the coastal region, where the disease is of primary economic importance, is recorded. General control of Anopheline larvae is impossible in native areas, but satisfactory results have been obtained by supervised spraying of dwellings against the adults, which has been carried out on a large scale (about 18,000 huts were sprayed weekly throughout the malaria season). A limited amount of anti-larval work has also been instituted, and drainage schemes promoted where the terrain is suitable.

In the Orange and Kuruman River areas, mosquitos breeding profusely in puddles during March and at the beginning of April proved to be *A. listeri*, De Meillon [*cf.* **19** 245], adults of which were found feeding on man and resting in houses. No malaria had occurred at this time, but *A. gambiae* was taken among the larvae of *A. listeri* in the middle

of April and shortly afterwards adults occurred in houses and malaria cases began to be recorded. Where measures were carried out, the incidence and spread of the disease were low in comparison with areas where no precautions were taken Towards the end of June the number of cases started to decrease, probably owing to the great diminution in the breeding of the vector. As the disease only began to spread when *A. gambiae* appeared in sufficient numbers, it would seem that *A. listeri* plays little or no part in transmission.

Notes are given on malaria control in the Pongola Irrigation Works and on the South African Railways, a subject that is discussed in detail in the two following papers.

Annecke (D. H. S.). **Report on Malaria Control: Pongola Irrigation Works.**—*Rep. Dep. publ. Hlth S. Afr. 1933–34* pp. 99–108. Pretoria, 1924.

A detailed account is given of the malaria control work carried out successfully during two malaria seasons (from November 1932 to June 1933 and from November 1933 to May 1934) in an intensely malarious area where an irrigation scheme is being developed for land settlement. *Anopheles gambiae*, Giles, was the vector; although *A. funestus*, Giles, was also found, adults were not taken in houses. The measures consisted of selecting suitable sites on high or rising ground, mosquito-proofing all dwellings, using mosquito nets, daily spraying of all sleeping quarters against adults, weekly oiling of all breeding-places within a radius of ½ mile or more, draining of collections of water where possible, and the employment of malaria-tolerant labour. During the second season, 60–75 per cent. of the labour was tolerant, and this enabled work to be continued even in places where measures against Anophelines could not be carried out. Periodical disinfection and fumigation of native quarters kept the numbers of lice [*Pediculus humanus*, L.] low and accounted for the absence of typhus and for better work by the natives, who were not disturbed by vermin during their sleeping hours. Details are given of the adult Anophelines caught in houses and the larvae taken throughout the period reviewed, and of the costs from July 1933 to May 1934. Routine catches of *A. gambiae* in houses where no malaria control measures were in force showed that the numbers began to diminish at the end of May; control operations were therefore stopped during the second season on 31st May. *A. gambiae* was found breeding in fairly large numbers in certain artificial containers, particularly in cement troughs situated along the distributive canals. The explanation may be that when all natural breeding-places have been oiled, the females are forced to oviposit in these unnatural sites.

Booker (C. G.). **Annual Report on the South African Railways and Harbours Health Organisation, 1933–34.**—*Rep. Dep. publ. Hlth S. Afr. 1933–34* pp. 108–115. Pretoria, 1934.

The organisation of the anti-rodent and anti-malaria campaigns of the South African Railways is discussed. In 1934 there were 4 organised malaria sections in the Transvaal and 8 in Natal, covering a total of 1,286 miles and protecting 12,797 employees. The general anti-malaria policy included eradication of Anopheline breeding-places by draining, reclamation, absorbing water by tree-planting, and fencing

to prevent hoof-print formation and restore vegetation, oiling and applying Paris green, and the use against the adults of insecticidal sprays, screening and nets. Careful surveys were made until larvae of *Anopheles gambiae*, Giles, were found, after which larvicides were applied at weekly intervals until the end of the breeding season. Such good results were obtained by supervised spraying against adults in 1933 that the application of this measure was considerably extended during 1934. The importance of site selection was demonstrated. The breeding of *A. gambiae* depends largely on the rainfall during periods of sustained high mean temperature. The drainage table of the coastal belt appears to be able to absorb a rainfall up to 4 inches in any one month ; any rainfall in excess of this amount remains above the surface, forming pools and seepages ideally suited for this mosquito.

MENOR Y ORTEGA (J. G.). **Informe del entomólogo-patólogo.** [Report of the Entomologist-Pathologist.]—*Mem. Sec. Agric. Com. Repub. Dominicana 1932*, pp. 117–133. Santo Domingo, 1934

The mosquitos observed in Santo Domingo in 1932 were *Anopheles albimanus*, Wied., and *A. grabhami*, Theo., both of which are vectors of malaria, *Aëdes* (*Stegomyia*) *aegypti*, L., the most common species in the Republic, *Culex pipiens*, L., and *Psorophora* spp.

EDWARDS (F. W.). **Oxford University Expedition to British Guiana, 1929—Diptera Nematocera.**—*Ann. Mag. nat. Hist.* (10) **14** no. 84 pp. 632–635. London, December 1934.

Anopheles mediopunctatus, Theo., is recorded as attacking man in a tree at a height of 110 ft.

MYERS (J. G.). **Field Observations on some Guiana Insects of Medical and Veterinary Interest.**—*Trop. Agriculture* **11** no. 11 pp. 279–283, 4 refs. Trinidad, November 1934. (Reprinted in *Vet. J.* **90** no. 12 pp. 485–492. London, December 1934.)

The author records observations on various insects made in the course of journeys in northern South America between the Orinoco and the lower Amazon. Considerable discomfort was caused by the persistent habit of entering the eyes shown by a small grey Anthomyiid, bees of the genus *Trigona* and a species of *Hippelates*, which were encountered in spots sheltered from the prevailing north-east wind. The most abundant blow-flies of the region were *Cochliomyia macellaria*, F., and *C. hominivorax*, Coq. (*americana*, Cushing & Patton) [see next paper]. The larvae of the latter infest wounds in cattle and were very troublesome in those caused on pack-bullocks by the bites of vampire bats. A list shows the Tabanids associated with different types of savannah and forest, and a note is included on the times of day at which certain of the species bite. *Musca domestica*, L., which was abundant at the place where the two routes to Roraima begin, along the short route, which passes chiefly through open savannah, and in Roraima itself, was absent along the greater part of the other route, which passes chiefly through mountain forest. What part the occasional horse and bullock traffic on the savannah route had played in the spread of this fly is not known.

Aubertin (D.) & Buxton (P. A.). *Cochliomyia* **and Myiasis in Tropical America.**—*Ann. trop. Med. Parasit* **28** no. 3 pp. 245–254, 1 pl., 26 refs. Liverpool, 19th October 1934.

The systematic position of the genus *Cochliomyia* is discussed, and it is considered to include four species (*macellaria*, F., *hominivorax*, Coq., *laniaria*, Wied., and *minima*, Shannon). Other species that have been referred to it are considered, largely on the opinions expressed in correspondence by the late Dr. J. M. Aldrich, to be synonymous with *Paralucilia fulvicrura*, R.-D., the type of its genus. *C. laniaria* has been caught on dead molluscs, and *C. minima* is unknown to the authors. *C. macellaria*, the types of which are probably no longer in existence, is considered to be the common American blow-fly that breeds in carrion, and *C. hominivorax* to be the species that had been confused with it until it was recently described by Cushing and Patton under the name *C. americana* [*R.A.E.*, B **22** 45]. A key to the four species, based on external characters, is given. Examination of adults and larvae from cases of human myiasis has confirmed the identity of the larva attributed tentatively to *C. hominivorax* (*americana*) by Cushing and Patton [*loc. cit.*]. All the reared specimens of *C. hominivorax* seen by the authors have been bred from living mammals, though there is no evidence to show that the species never inhabits carcases. Structural evidence suggests, however, that it is parasitic, since, as pointed out by Cushing and Patton, the larva of *C. macellaria* has ribs on the floor of the pharynx, whereas the larva that is now known to be that of *C. hominivorax* has none [*cf.* **12** 60]. Previous observations on the biology of *C. hominivorax* show that the egg stage lasts less than 24 hours, the larval stage less than 9 days and the pupal stage about 11 days. The female probably lays a large number of eggs at one time, for several authors record the recovery of 150–200 fully grown larvae from single cases. The countries of origin of the specimens of *C. macellaria* and *C. hominivorax* that have been examined are given. Knowledge of the distribution of these two species is very imperfect, but it appears that both are widely distributed in the West Indies and the American Continent from about 35°N. to 35°S. Lat. Available information suggests that myiasis due to *C. hominivorax* is commoner in man than in animals, but this may be due to the fact that most of the material has been collected by medical men. The authors have specimens from cattle in several countries but none from other animals. Although records show that larvae have been taken from infected or diseased sites, they have also been obtained from healthy tissues.

Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Species of the Genus** *Glossina* **Wiedemann based on a Comparative Study of the Male and Female Terminalia.**—*Ann. trop. Med. Parasit.* **28** no. 3 pp. 315–322, 6 figs. Liverpool, 19th October 1934.

In the present paper, descriptions are given of the terminalia of both sexes of *Glossina longipennis*, Corti.

Parrot (L.). **The Natural Transmission of Mediterranean Leishmaniasis.**—*Quart. Bull. Hlth Org. L.o.N.* **3** no. 2 pp. 202–219, many refs. Geneva, June 1934. [Recd. November 1934.]

Present knowledge concerning the various forms of leishmaniasis attacking man, dogs and cats, particularly in the Mediterranean Basin,

their relation to each other, and their mode of transmission, is reviewed from the literature, and the problems to be solved by future research are briefly indicated.

SERGENT (Ed.) & SERGENT (Et.). **Fly-free Manure Heaps.**—*Quart. Bull. Hlth Org. L.o.N.* **3** no. 2 pp. 299–303, 4 figs. Geneva, June 1934. [Recd. November 1934.]

Descriptions are given of two types of containers, suitable for manure disposal in the town and in the country, that have been tested by the Pasteur Institute at Algiers and found satisfactory in preventing the breeding of flies, which only lay eggs on fresh manure. In the town type, which has been in use for 22 years, two chambers, each having a capacity of about 18 cu. yds., are built of reinforced concrete raised on pillars so designed that a cart can be placed underneath. Each has two horizontal openings on the top and a vertical opening in front, all closed with overlapping covers of sheet iron. Twice a day, stable manure is discharged from barrows through the trap door in the top into one of the containers. In 10–15 days, this container becomes full and is tightly closed and left while the second chamber is being filled. The manure in the first container, which after 8 days is well matured, is next discharged through the door in the front into a cart backed in between the supporting pillars. The liquid manure is drained from the floor of each chamber through a pipe into a closed pit, whence it can be removed at will. The fermentation in the chamber engenders a high temperature that is fatal to insects, and no eggs or larvae were found, except occasionally along the bottom rims of the vertical sheet iron covers, which are cooler than the other parts of the chambers. Although flies visited a heap of warm damp black manure just removed from the container, no eggs could be found on it.

The rural type of container is based on the principle that fly larvae seek dry surroundings in which to burrow for pupation, and is a modification of Baber's traps [*cf. R.A.E.*, B **7** 5; **14** 25]. A concrete floor about 3 yds. square is fenced in with stout wire netting frames about 5 ft. high and surrounded by a masonry gutter about 8 ins. wide and deep. Along both edges of the gutter, a narrow strip of sheet iron is fitted with the inner edge folded downwards so as to form an acute angle with the edge of the gutter. The manure is discharged into the enclosure, stacked against the netting, and watered and rammed tight to facilitate fermentation. Fly larvae that have hatched and remained in the upper layers of the heap try to leave the fermenting mass when about to pupate ; they fall into the gutter and cannot get out, so that they die in the liquid manure or are eaten by birds. It is recommended that more than one such platform be constructed, so that when one is full, the manure may be left to mature completely before being spread on the fields, and thus be unsuitable for breeding flies.

WHITEHEAD (W. E.) & MAW (W. A.). **Control of the Northern Fowl Mite.**—*Sci. Agric.* **15** no. 2 p. 126. Ottawa, October 1934.

Liponyssus sylviarum, C. & F. (northern fowl mite) has been successfully controlled in Quebec [*cf. R.A.E.*, B **19** 223] with a mixture of one part of finely ground naphthalene flakes stirred into two parts vaseline

and applied either to the perches in the fowl-houses or in small quantities around the tail and vent of the birds, where the mites usually congregate. For some time 40 per cent. nicotine sulphate has been used on the perches [*cf.* **19** 185 ; etc.], but comparative tests in the laboratory indicate that its action is slower than that of the naphthalene preparation, and where a large area is to be covered its cost is considerable. Good results have also been obtained with the naphthalene mixture against *Eomenacanthus stramineus*, Nitzsch, although it acts more slowly. In this case it is necessary to distribute it over the birds, as the lice do not as a rule show the same tendency as the mites to confine themselves to definite areas. The fumes of the naphthalene are apparently not so lethal to lice as to mites.

HENRARD (C.). **Quelques essais de capture de** *Glossina palpalis* **au moyen de divers types de piège Harris près du Stanley Pool.**—*Ann. Soc. belge Méd. trop.* **14** no. 3 pp. 263–276, 2 figs. Brussels, 30th September 1934.

Details are given of the results of trapping experiments carried out in 1933–34 on an island in the River Congo near Leopoldville, using various types of tsetse traps based on the Harris model [*cf. R.A.E.*, B **19** 78] against *Glossina palpalis*, R.-D., of which the average density in the most populous sites was 10–15 per boy hour. A collapsible trap made of light-coloured khaki cloth on a wooden frame gave the most satisfactory results. In one set of experiments with it the maximum catch was 215 flies in 8 days ; in another the average monthly catch was 465 flies. Further experiments showed that the catches were greatly increased when man or animals were present in the vicinity of the traps. It is concluded that although such traps do not constitute a means of entirely eliminating flies, they might be used with advantage at such places as river crossings, springs, etc.

CAMPBELL (F L.), SULLIVAN (W. N.) & JONES (H. A.). **Kerosene Extracts of Derris Root as House Fly Sprays.—II. Comparative Tests of Extracts of Derris and Pyrethrum.**—*Soap* **10** no. 4 pp. 83, 85, 103, 105, 1 fig., 3 refs. New York, 1934.

Experiments are described in which kerosene extracts of derris roots, which have recently been found [*R.A.E.*, B **22** 131] to be of value in killing house-flies [*Musca domestica*, L.], are compared with kerosene extracts of pyrethrum, which are commonly used for this purpose. Extracts from 5 gm. and 20 gm. of each plant made with 100 cc. kerosene were tested against house-flies in cages, and extracts from 1 lb. of each plant with 1 U.S. gal. kerosene in Peet-Grady chambers [*cf.* **16** 255] and rooms. It was found that the extract from 5 gm. derris root was almost as effective as that from 20 gm. pyrethrum flowers, and as the cost of the two materials is about equal, the derris extracts should be cheaper. The pyrethrum extracts paralysed the flies more rapidly and completely, but the derris extracts were ultimately more effective in killing them, so that the former would probably give better control in places where the flies could be swept up and destroyed, but where this could not be done the latter would be of greater value. Extracts of derris prepared with a colourless and almost odourless kerosene are practically colourless and odourless, whereas extracts of pyrethrum are a deep yellow and have the characteristic odour of pyrethrum.

[Buichkov-Oreshnikov (V. A.).] **Бычков-Орешников (В. А.). On the Microflora of the Flies of some of the Camps and on the Rôle possibly played by them in the Distribution of intestinal Diseases.** [*In Russian.*]—*Trav. Acad. milit. Méd. Armée rouge URSS* **1** pp. 393–400, 1 ref. Leningrad, 1934.

In the summer of 1932 an investigation was made of the sanitary conditions of a large military encampment in Central Asia and of the part played by flies in the frequent outbreaks among the troops of acute enteric diseases, which are particularly prevalent in July and early August when these insects are most numerous. House-flies [*Musca domestica*, L.] captured in various parts of the encampment showed a high rate of infection with bacteria of the intestinal type, of which nine different species were obtained. The numbers present on the surface of the flies sharply decreased in July and August as a result of the extreme dryness of the air and strong sunlight. The percentage of slightly infected or uninfected flies was especially high in cook-houses at distances of about 100–300 yards from the latrines, the space between being devoid of vegetation, so that flies crossing it were exposed to the direct rays of the sun. The microflora of the digestive tract of the flies was, however, not affected.

Camps should be arranged with the cook-houses as far as possible from the troops' hutments and latrines. Huts, etc., should be between the latrines and cook-houses, so that the flies do not migrate directly from latrines to cook-houses and thus have longer to become free from infection. The contents of latrines should be sprayed [see next paper], and the windows and doors of the hospitals should be screened.

[Chebotarevich (N. D.).] **Чеботаревич (Н. Д.). Breeding Places of Flies and their Control under Conditions of the Camps of the Central-Asiatic Military District.** [*In Russian.*]—*Trav. Acad. milit. Méd. Armée rouge URSS* **1** pp. 411–418. Leningrad, 1934.

In the summer of 1932 a campaign against flies was carried out on a large scale in a military encampment in Central Asia, the scheme including the screening of cook-houses and various improvements in sanitation, including the elimination of breeding-places of the house-fly [*Musca domestica*, L.]. Only very few larvae occurred in horse manure, probably owing to its rapid desiccation ; larvae and pupae were, however, almost invariably present in cow-dung. Human excreta and kitchen refuse were the chief breeding-places. In field and laboratory tests of sprays for use against the larvae in latrines, crude oil failed to kill them, though it appeared to have a repellent effect on the ovipositing flies. A 5 per cent. solution of crude carbolic acid in crude oil, however, applied at the rate of about 1 pint to 12 sq. ft., killed all the larvae within 24 hours. Sodium arsenite used in small concentrations was also very effective in the laboratory, and a high mortality of the larvae was observed in latrines treated with a 1 per cent. solution, but it is dangerous to use. The adult flies were poisoned with formalin solution. The best way of exposing it is to pour the solution into a tumbler and cover it with a plate containing a sheet of blotting paper. The whole is then inverted, and a match is introduced under one edge of the tumbler. In this way the blotting paper is kept moist as long as some formalin remains in the tumbler.

Kleine (F. K.) & Krause (M.). **Die Rolle der Wanze bei der Verbreitung des Rückfallfiebers.** [The Rôle of the Bug in the Spread of Relapsing Fever.]—*Arch. Schiffs- u. Tropenhyg.* **38** no. 11 pp. 486–487. Leipzig, November 1934.

Rosenholz succeeded in maintaining the spirochaetes of relapsing fever in bugs [*Cimex lectularius*, L.] over a long period by puncturing the stomach and drawing infected blood from it into the body cavity [*R.A.E.*, B **15** 121]. On the hypothesis that in quite young bugs the soft intestinal epithelium would permit the passage of the spirochaetes without artificial aid, the authors allowed newly-hatched larvae to feed on infected mice. From the sixth day onwards batches of 2–10 of these larvae were crushed and inoculated at intervals into healthy mice. Inoculations demonstrated infection after 28–80 days in 4 per cent. of 300 bugs, one larva in each batch being regarded as infected for calculating this percentage. Of 150 bugs that had fed when adult, none caused infection when inoculated 6 or more days later. Of 3,000 larvae, the progeny of bugs infected as larvae, none proved infective. It is therefore concluded that bugs are unimportant as reservoirs of relapsing fever.

Ohmori (N.). **Considerations on the Distribution of** *Cimex hemiptera* **Fab.** [*In Japanese.*]—*Bot. & Zool.* **2** no. 10 pp. 1677–1688. Tokyo, October 1934.

Ohmori (N.). **Experimental Studies on the Influence of low Temperatures upon the tropical Bed Bug** (*Cimex hemiptera* **Fab.**). **First Report.** [*In Japanese.*]—*J. med. Ass. Formosa* **33** pp. 1393–1408, 1511–1527. Taihoku, Formosa, October 1934. (With a Summary in English.)

The distribution of *Cimex hemiptera*, F., which is common in Formosa and also occurs in the Loochoo Islands, but not in Japan, is limited by low winter temperatures. The eggs, nymphs and adults were reared in an incubator at 27°C. [80·6°F.] and about 75 per cent. relative humidity, and then exposed to various low temperatures for definite periods. Eggs survived for at least 52 days at 7–9°C. [44·6–48·2°F.] and 100 per cent. humidity, and for 39 days at 9°C. and 75 per cent. humidity, but showed no embryonic development until transferred to a higher temperature. Eggs did not hatch at any temperature below about 15°C. [59°F.], the mean winter temperature at Taihoku (Formosa). Engorged nymphs did not moult at 7–9°C. or 9°C., and were not able to moult normally at 12–15°C. [53·6–59°F.]. The adults and nymphs died within 3 months at 9°C.; the longest survival was observed in a fed fourth-instar nymph and a fed female, which lived 84 days. Pairing does not occur below 12–15°C., but females that had paired before exposure to 9°C. were able to oviposit for 39–52 days. The low temperatures in Japanese houses during winter render impossible the establishment of this species in Japan, but in Korea the houses are heated so that it can spread in spite of the severe winters.

Arakawa (Y.) **Studies on** *Pediculus corporis* **De Geer.** [*In Japanese.*] —221+xi pp., 47 pls. Tairen, Manchuria, Association for the Publication of the late Mr. Y. Arakawa's papers, August 1934.

This work deals in detail with studies on the biology, anatomy and physiology of *Pediculus humanus*, L. (*corporis*, DeG.), and experiments

on the transmission by it of typhus and relapsing fever, as well as with studies on *Phthirus* (*Phthirius*) *pubis*, L., [*cf. R.A.E.*, B **22** 7], and on *Wohlfahrtia* (*Sarcophaga*) *magnifica*, Schin., in Mongolia. In Manchuria *P. humanus* is very common, especially in April and May when typhus is most prevalent. Only the adults transmit typhus; the bacilli propagate in the body of the louse and are found in it and its excreta for 5–8 days after it has fed on an infected person. *Pediculus capitis*, DeG., is said not to transmit the disease. The spirochaetes of relapsing fever live only about an hour when excreted from the louse, and the disease is not caused by biting but by contact with crushed lice or their excreta [*cf.* **16** 58, etc.].

Roberts (F. H. S.). **The Parasites of Sheep.**—*Qd agric. J.* **42** pt. 3 pp. 337–359, 2 pls., 11 figs. Brisbane, September 1934.

This is an account taken from the literature of the bionomics and control of the chief parasites of sheep in Queensland, the most important Arthropods being blow-flies [*cf. R.A.E.*, B **20** 36] and *Bovicola ovis*, L., *Linognathus pedalis*, Osb., *Melophagus ovinus*, L., and *Ixodes holocyclus*, Neum. [*cf.* **21** 118, etc.].

Dias (E.). **Persistance de l'infection par le** *Schizotrypanum cruzi* **chez l'homme.**—*C. R. Soc. Biol.* **117** no. 31 pp. 506–507. Paris, 1934.

The persistence of *Trypanosoma* (*Schizotrypanum*) *cruzi* for many years in man has been demonstrated by the finding of parasites in the blood of a patient in Brazil who had been in hospital since September 1922, and had consequently been safeguarded from all possibility of re-infection. The parasites were demonstrated in 1934 by intraperitoneal inoculation of blood into a guineapig and by the finding of developmental forms of *T. cruzi* in an example of *Panstrongylus* (*Triatoma*) *megistus*, Burm., that had fed on the patient 48 days previously.

Townsend (C. H. T.). **Mosquitoes of the Rio Tapajós.**—*Rev. Ent.* **4** no. 4 pp. 486–499. Rio de Janeiro, 31st October 1934.

This paper contains a key to 64 species of mosquitos collected on the Tapajós river in the districts of Bôa Vista and Urucurytuba, Brazil, with notes on them.

The Anophelines are: *Anopheles mattogrossensis*, Lutz & Neiva, taken on horses; *A. mediopunctatus*, Theo., of which a single male was obtained, in the woods; a race of *A.* (*Nyssorhynchus*) *albimanus*, Wied., reared from an unshaded pool and taken on horses; *A.* (*N.*) *albitarsis*, Arrib. (with var. *braziliensis*, Chagas), which is possibly an important vector of malaria and was found abundantly from mid-July to mid-August breeding in submerged grass on sunny river margins and in open ground pools and entering houses freely; *A.* (*N.*) *bachmanni*, Petrocchi, breeding in open ground pools and river margins and probably unimportant as a vector; *A.* (*N.*) *darlingi*, Root, which is probably the chief vector in these districts, and was abundant in May and June, entering houses and breeding in river margins and ground pools, especially those exposed to sunshine; and *A. tarsimaculatus* var. *oswaldoi*, Peryassú, or an allied form. The last-named is the Anopheline of which the identity was discussed by the author in previous papers

[*R.A.E.*, B **21** 149]. All stages are described. It does not enter dwellings, but as it the only Anopheline found in the forest, where it is active by day and night, and various cases of malaria appeared to be traceable to infection contracted in or on the edges of the forest, it seems to be an active vector out of doors.

NURSING (D.), RAO (B. A.) & SWEET (W. C.). **Notes on Malaria in Mysore State. Part VII. The Anopheline Transmitters of Malaria.** —*Rec. Malar. Surv. India* **4** no. 3 pp. 243–251, 4 refs. Calcutta, September 1934.

The results are given of dissections of Anophelines carried out in Mysore State in 1932 and 1933 in three areas in or near the study stations established in 1928 and 1929 [*cf. R.A.E.*, B **22** 68], where malaria is endemic, and in another area where malaria was epidemic. The catches were made in houses and cattle sheds between 8 a.m. and noon, and in the three endemic areas also in a tent with human bait at 9 p.m., midnight, 4 a.m. and 6 a.m. In the endemic areas, 3,438 mosquitos were dissected and infections were found in *Anopheles culicifacies*, Giles (oöcyst and sporozoite rates 2·5 and 0·2 per cent. respectively), *A. fluviatilis*, James (oöcyst and sporozoite rates 2·4 and 0·8 per cent. respectively), *A. stephensi*, List. (oöcyst rate 1·1 per cent.), *A. jeyporiensis*, James (oöcyst rate 0·3 per cent.), and *A. varuna*, Iyen. (one stomach out of 33 showing oöcysts). In the epidemic area, 1,151 females of *A. culicifacies* and 532 of other species of Anophelines were dissected, but infections were found only among the former, the oöcyst rate being 2·3 and the sporozoite rate 1·0 per cent. The catch of *A. fluviatilis* in this area was small.

Apparently *A. culicifacies* and *A. fluviatilis* are the important malaria vectors in the rural areas of Mysore; *A. stephensi* and *A. varuna* may be of minor importance, but *A. jeyporiensis* is probably not concerned in transmission. The infection rate of *A. culicifacies* and *A. fluviatilis* caught in the tent was 2·2 per cent. and of the same species caught in houses and cattle-sheds 3·1, and it is suggested that night collections in houses and cattle-sheds might show higher sporozoite rates. *A. aconitus*, Dön., *A. culicifacies*, *A. jeyporiensis* and *A. stephensi* constituted higher proportions of the total catch in houses and cattle-sheds than in the tent, whereas the reverse was the case with *A. fluviatilis*, *A. hyrcanus*, Pall., and *A. jamesi*, Theo. The first group seem to use habitations for daytime resting places, but the second seem to prefer other situations. More than half the numbers of the first group caught in tents were taken at 4 and 6 a.m., whereas members of the second group were caught more commonly at 9 p.m. and midnight.

BOSE (K.). **Larval Survey of the Land around Birnagar and Determination of the Longevity of the Local** *Anopheles culicifacies* **and its Habits.**—*Rec. Malar. Surv. India* **4** no. 3 pp. 253–259, 1 map, 5 refs. Calcutta, September 1934.

As much of the work against Anopheline larvae carried out at Birnagar (Bengal) [*cf. R.A.E.*, B **19** 204] was nullified by invasions of *Anopheles philippinensis*, Ludl., from uncontrolled areas outside, larval surveys were undertaken in the villages in the vicinity during 1932 and 1933. The mosquito fauna was found to be similar to that of Birnagar,

except that *A. culicifacies*, Giles, which is a dangerous vector of malaria in the Punjab and southern India, was found in the River Churni; it was only observed, however, in the dry season when the malaria incidence is low. During the rainy season, when all the other Anophelines are active and breeding, no larvae of *A. culicifacies* were found, so that adults must survive for the period of about four months (July to November) while the river is in flood. A few adults and larvae of this species were found in Birnagar on rare occasions. Apparently some mosquitos are carried to the town from the river by carts, etc., but they cannot thrive, and they die out, since no suitable breeding-places are available. As the shortest distance between Birnagar and the Churni is ½ mile, it is concluded that *A. culicifacies* cannot ordinarily fly so far from its breeding-place. The different types of breeding-places investigated and the species found in them are discussed. *A. hyrcanus* var. *nigerrimus*, Giles, was the commonest species observed, followed by *A. annularis*, Wulp, *A. subpictus*, Grassi, and *A. vagus*, Dön., in the order of their abundance. *A. philippinensis* breeds chiefly in reservoirs in Birnagar and its environs; none was found in the river or in rice-fields and only a few in canals and borrow pits. It prefers water collections containing vegetation; it was attracted to clean reservoirs when vegetation was introduced and repelled when it was removed. As *A. culicifacies* does not appear to be concerned in the transmission of malaria in this locality, *A. philippinensis* is thought to be the vector in the environs of Birnagar as well as in the town itself.

MEHTA (Dev Raj). **Studies on the Longevity of some Indian Anophelines. Part I. Survival of *Anopheles subpictus* Grassi under controlled Conditions of Temperature and Humidity.**—*Rec. Malar. Surv. India* **4** no. 3 pp. 261–272, 1 fig., 2 charts, 33 refs. Calcutta September 1934.

Among the very large numbers of *Anopheles subpictus*, Grassi, that have been dissected in different parts of Ceylon, India and the Philippines, infection with malaria parasites has only once been observed and then only in the gut, but natural infections have been reported by several observers in the Netherlands Indies. Since it is probable that physical factors, particularly temperature and humidity, may so affect the longevity of the adults that the sporozoites do not have time to develop, experiments were undertaken to determine their length of life under controlled conditions. Adults reared from pupae were given a blood meal 10–12 hours after emergence and placed in a netting cage (with soaked raisins to supply nourishment and moisture) in desiccators in which humidity was controlled by means of sulphuric acid and water mixtures. Temperature was controlled by using heating or cooling incubators. The results indicate that the most favourable degree of humidity was about 70 per cent., as this induced the maximum longevities at all temperatures studied. Both low humidity (30 per cent.) and high humidity (90 per cent.) were detrimental, the influence of the latter being particularly marked at 77°F. At 104°F., the females did not survive for more than 24–50 hours; at 95°F. the period was increased to 3–8 days and at 86°F. to 6–14 days. At 77°F. the adults may live for a much longer time, 20 days or more being recorded in some cases. It is concluded that the majority of adults do not survive in nature at Karnal, Punjab, for more than 5–11 days, taking into

consideration the variations in atmospheric humidity and the temperature ranging about 86°F., so that the malaria parasite would be unable to complete its development in this host. Although this may be one of the reasons why *A. subpictus* does not act as a vector, other factors are probably involved, for this species has been infected in the laboratory and viable sporozoites demonstrated in its salivary glands [*R.A.E.*, B **18** 195].

Covell (G.). **Note on the Control of Mosquitoes and Malaria in Delhi.**—*Rec. Malar. Surv. India* **4** no. 3 pp. 273–289, 28 refs. Calcutta, September 1934.

The author paid a visit to New Delhi on 14th–15th April 1934 to give advice on the prevailing mosquito nuisance and on the control of malaria.

His investigations led him to conclude that the large numbers of Culicines present were less likely to have originated on a sewage farm more than a mile from the town than in small collections of water in the immediate vicinity of the places from which complaints had been received, and that the most effective measure would be the more adequate supervision of anti-mosquito work. He endorses the proposed removal of the sewage farm to a more distant site, for the increasing water-logging of the soil that has occurred during recent years prevents monsoon rainfall from soaking into the soil and so favours the breeding of Anophelines and the consequent incidence of malaria in neighbouring villages.

With regard to malaria control in Delhi, the author outlines the recommendations that have been made by experts on this question during the past 25 years and points out how little action has been taken along the lines recommended. He considers that the problem will never be satisfactorily solved until a full-time malaria officer is appointed and the recommendations of Christophers (MS report) and Senior-White [*R.A.E.*, B **19** 42], as modified by the Delhi Malarial Committee in 1928, have been carried out.

Knowles (R.) & Basu (B. C.). **Mosquito Prevalence and Mosquito-borne Diseases in Calcutta City.**—*Rec. Malar. Surv. India* **4** no. 3 pp. 291–319, 1 map, 1 fig., 10 charts, 38 refs. Calcutta, September 1934.

The breeding of *Anopheles stephensi*, List., and *Aëdes aegypti*, L., was closely studied from July 1928 to June 1932, and of *Culex fatigans*, Wied., during 1931 and 1932, in an area of Calcutta one square mile in extent; the limits of the distribution of *A. stephensi* in and around Calcutta were also observed.

The following is largely taken from the authors' summary: *A. stephensi* breeds in large numbers in almost every receptacle used for water storage throughout the City [*R.A.E.*, B **20** 195], especially in masonry tanks and overhead galvanised iron cisterns on roofs. Out of 11,927 possible breeding-places examined, 33 per cent. contained larvae of this species. The maximum amount of breeding occurs in July and August. There is a heavy continuous importation of malaria infection into the City by persons returning from holidays and immigrants from malarious rural areas, the local strain of *A. stephensi* can be readily infected experimentally, and meteorological conditions are

suitable for transmission during a large part of the year, yet the amount of endemic malaria is slight [*cf. loc. cit.*]. The chief reason for this appears to be that the maximum abundance of *A. stephensi* does not coincide with the period when the number of cases of malaria is greatest (October–November) or the number of gametocyte carriers highest (December).

Aëdes aegypti utilises the same types of breeding-places as *A. stephensi*; it occurred in 41 per cent. of the 11,927 breeding-places examined. The lowest numbers were found in February and April and the greatest in July and August, a period that is correlated with the maximum number of fresh infections with dengue in August and September. This correlation accounts for the devastating epidemics of dengue that often occur in the City, causing enormous financial loss. The chief breeding-places of *Culex fatigans*, Wied., are the same as those of the other two species, 8 per cent. of 4,339 breeding-places examined showing larvae of this species. The minimum numbers of larvae were found in July and the maximum in November. New cases of filariasis are observed throughout the year, but the most favourable period for transmission is during the monsoon (July–September) [**18** 140], when the numbers of *C. fatigans* are low. Conditions for transmission are rapidly becoming unsuitable at the time when *C. fatigans* is most numerous, and this fact probably accounts for the relatively low level of the filariasis rate (9·5 per cent.). The solution of the problem of the control of these mosquitos lies in the provision of a continuous high-pressure water-supply to replace the present low-pressure supply, which is intermittent and so necessitates water storage throughout the City.

TAYLOR (F. H.). **The Diptera of the Territory of New Guinea. I. Family Culicidae.**—*Proc. Linn. Soc. N.S.W.* **59** pt. 3–4 pp. 229–236, 1 fig. Sydney, 15th September 1934.

Notes are given on 25 species of mosquitos from the Territory of New Guinea collected chiefly in the course of two expeditions, and including 10 species not previously recorded from the Territory. The Anophelines comprised *Bironella* (*Brugella*) *hollandi*, sp. n., and *Anopheles longirostris*, Brug, from New Ireland, *A. punctulatus*, Dön., from New Guinea and New Britain, and *A. punctulatus* var. *moluccensis*, Sw. & Sw. de G., from New Britain and New Ireland.

STOKER (W. J.). **Over de malariagevaarlijkheid van** *A. leucosphyrus*. [On the Importance of *A. leucosphyrus* as a Vector of Malaria.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 21 pp. 1342–1344, 8 refs. Batavia, 9th October 1934. (With a Summary in English.)

A brief survey of the literature shows that *Anopheles leucosphyrus*, Dön., has been found infected with malaria in the Netherlands Indies, but is considered of doubtful importance as a vector there and in India and Malaya. Anophelines were collected, mainly by day, in dwellings at Sarang-Tioeng, where malaria is hyperendemic, and in a neighbouring village, both on the north-east coast of Poeloe Laoet, an island off the coast of Borneo. Infection was found in 7 out of 110 females of *A. leucosphyrus* but not in 11 of *A. maculatus*, Theo., or 32 of *A. hyrcanus* var. *sinensis*, Wied. *A. leucosphyrus* has previously been considered not to enter houses in numbers [*R.A.E.*, B **15** 110]. A number of

domestic animals are kept at Sarang-Tioeng. Most of the Anophelines found as larvae were *A. leucosphyrus* and *A. maculatus*; others included *A. aitkeni*, James, and *A. barbumbrosus*, Strickl. & Chowd.

GOELARSO (—). **Larven- en Muskietenvangsten in de onderafdeeling Boeloengan (Oost-Borneo).** [Catches of Mosquito Larvae and Adults in the Sub-division Boeloengan (East Borneo).]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 21 pp. 1345–1352, 9 refs. Batavia, 9th October 1934.

A detailed account is given of the Anophelines collected in various localities in the subdivision of Boeloengan in East Borneo. In some in which malaria was generally scarce, *Anopheles kochi*, Dön., represented all the adults and most of the larvae taken. Larvae of *A. leucosphyrus*, Dön., occurred in smaller numbers. In the Sadjau district, where endemic malaria is more severe, only adults of *A. leucosphyrus* were found, while of the larvae *A. umbrosus*, Theo., was the most abundant species. This suggests that these two are the vectors. In the hilly interior, where there is much endemic malaria, *A. leucosphyrus* and *A. maculatus*, Theo., predominated in houses and in mosquito breeding-places.

The relation of *A. leucosphyrus* to malaria [*cf.* preceding paper] was further confirmed by the finding of 1 infected female out of 13 collected in a village where in September 1933 the spleen and parasite indices were 64 and 25 per cent.

HELFFERICH (W. M. G.). **Merkwaardige uitkomsten van een malaria-onderzoek in de Onderafdeeling Dairilanden (Residentie Tapanoeli).** [Remarkable Results of a Malaria Investigation in the Subdivision Dairilanden (Residency of Taponoeli).]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 22 pp. 1438–1446. Batavia, 23rd October 1934. (With a Summary in German.)

In the Dairilanden district, Sumatra, where a clinically mild malaria is endemic, the parasite index is unusually high and often higher than the spleen index. This peculiarity, which appears permanent in the district, was ascertained in the course of an investigation here described in detail.

The Anopheline fauna was examined at the capital, Sidikalang. No infected Anophelines were taken, and it would appear that the malaria vector must pay only short visits to houses, for in about a year only 43 adults were found in them, *viz.*, 29 *Anopheles maculatus*, Theo., 1 *A. hyrcanus* var. *sinensis*, Wied., 1 *A. kochi*, Dön., 4 *A. barbirostris*, Wulp, 5 *A. philippinensis*, Ludl., and 3 *A. vagus*, Dön. During the same period 842 Anophelines were taken in cow and buffalo sheds, *viz.*, 490 *A. maculatus*, 35 *A. hyrcanus* var. *sinensis*, 28 *A. kochi*, 2 *A. barbirostris*, 7 *A. philippinensis*, 251 *A. annularis*, Wulp (*fuliginosus*, Giles), and 29 *A. vagus*. All collections of water, drains, etc., contained larvae in about the same proportion as the adults, except that *A. hyrcanus* var. *sinensis* was more common. *A. maculatus* is therefore regarded as the probable vector of malaria, *A. hyrcanus* var. *sinensis* being considered of little or no importance.

At Pandiangan, the most malarious village in the district, 9 examples of *A. hyrcanus* var. *sinensis* were taken in 30 houses in December 1933.

The larvae collected were 3 *A. maculatus*, 5 *A. hyrcanus* var. *sinensis*, 8 *A. annularis*, 7 *A. kochi*, 5 *A. barbirostris* and 19 *A. barbumbrosus*, Strickl. & Chowd.

HEADLEE (T. J.). **Cat and Dog Fleas.**—*Circ. N. J. agric. Exp. Sta.* no. 329, 4 pp. New Brunswick, N.J., August 1934. [Recd. November 1934.]

For eradicating infestations of *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., and *C.* (*C.*) *felis*, Bch., which often occur in dwellings and attack man in New Jersey, dogs and cats should have a dust composed of 20 per cent. pyrethrum powder, 5 per cent. derris powder and 75 per cent. talc rubbed thoroughly into their fur, and the infested parts of the house should be sprayed with a pyrethrum fly-spray. In unfurnished cellars a mixture of equal parts of pyrethrum spray and kerosene may be used. If infestation is very heavy, fumigation with hydrocyanic acid gas may be carried out. When the infestations occur out of doors on bare soil, a heavy oil such as waste motor oil may be applied, but where grass is growing a mixture of pyrethrum, soap and water should be used. This mixture is prepared by dissolving 1·6 oz. 40 per cent. coconut oil soap in 1 U.S. gal. cold water and stirring in $\frac{1}{4}$ oz. 20-fold alcoholic extract of pyrethrum previously dissolved in a small amount of water.

HERMS (W. B.), WHEELER (C. M.) & HERMS (H. P.). **Attempts to transmit Equine Encephalomyelitis by Means of Blood sucking Insects, especially Mosquitoes.**—*J. econ. Ent.* **27** no. 5 pp. 987–998, 3 figs., 3 refs. Geneva, N.Y., October 1934.

In experiments, the technique of which is described, negative results were obtained in California during 1932–34 in attempting to transmit equine encephalomyelitis by means of *Lyperosia irritans*, L., *Tabanus punctifer*, O.S., *Aëdes dorsalis*, Mg., and *Anopheles maculipennis*, Mg. Reference is made to the positive results obtained by Kelser with *Aëdes aegypti*, L. [*R.A.E.*, B **21** 155 ; *cf.* also **22** 226]. In the case of *A. dorsalis* 4–17 days were allowed to elapse between feeding on infected and healthy animals, and 3–16 days in the case of *A. maculipennis*. Of the four species used, only *Lyperosia* and *Tabanus* were consistently present in localities where cases of equine encephalomyelitis had been known to occur. No test was made with *Stomoxys calcitrans*, L., which was also consistently present. *Aëdes dorsalis* was tested because it belongs to the same genus as *A. aegypti*. *Anopheles maculipennis* is common and widespread in the central valley of California.

SCHROEDER (C. R.). **The Snake Mite** (*Ophionyssus serpentium* **Hirst**).—*J. econ. Ent.* **27** no. 5 pp. 1004–1014, 3 figs., 2 refs. Geneva, N.Y., October 1934.

An account is given of *Ophionyssus serpentium*, Hirst, a mite known to attack snakes of several different genera, observations on which were carried out in a reptile house in California. The original description of this Dermanyssid is quoted. It will also attack man and birds, though it only remains on these hosts for limited periods. Examinations made over a period of 3 years gave evidence of infestation by this mite in 75 per cent. of all dead snakes and an experiment showed that it is able to cause their death. It was found to reproduce

off the host on finely divided soil, preferably rich in humus, with normal moisture content. The adult female lays singly more than 30 eggs, which hatch within 72 hours. The hexapod larva is active for less than 24 hours before moulting, and has never been observed feeding on snakes. The newly emerged octopod nymph is extremely active and immediately seeks food, and the deuteronymph is similarly active. On the snakes, the mites move rapidly, feeding under the scales. On soil, they always avoided a moist area if a dry one was available. Their activity was directly proportional to the temperature, but overnight freezing (20°F.) did not destroy all those on a dead snake.

An enquiry showed the mite to be widely distributed in zoological collections in the United States. Control must be directed towards its elimination from the cages, etc. Aqueous solutions of acetone extract of rotenone from derris have been found satisfactory as an acaricide in which to dip snakes. Enclosures should be treated by heat, with a blow-torch or preferably a steam hose, and soil should be autoclaved, or heated by some other method before being placed in them. Surfaces should not be left moist as this is harmful to snakes. Mite migration should be prevented by the use of an oil or water barrier. Many nymphs and adults were attracted to white flannel cloths placed over the cages at night. An attempt is being made to select as a predator one of the beetles that feed on phytophagous mites.

HERMS (W. B.). **Mosquito Control in California under the CWA.**—*J. econ. Ent.* **27** no. 5 pp. 1014–1029, 3 figs. Geneva, N.Y., October 1934.

An account is given of work done under the Civil Works Administration in mosquito control in California from December 1933 to April 1934. About 57 miles of drainage ditches were constructed. The banks of streams were cleared, swamps filled in and tide-gates and culverts repaired. Large numbers of *Gambusia* were distributed, and many potential breeding-places were eliminated. A list of 15 species of mosquitos collected is given.

RODENWALDT (E.). *Filaria malayi* **im Delta des Serajoe III.**—*Meded. Volksgezondh. Ned.-Ind.* **23** no. 4 pp. 194–212, 7 pls. Batavia, 1934.

Previous investigations on *Mansonia annulifera*, Theo., and *M. indiana*, Edw., in the Serajoe Delta, Java, established their biological relation to *Pistia stratiotes* [*R.A.E.*, B **22** 105]. In further experiments, the larvae of these species could be reared to the pupal stage even under extremely adverse conditions, provided that their great voracity was satisfied, the requisite food being dried and powdered guineapig excreta, which contain half-decomposed vegetable matter. The powdered excreta of other herbivorous animals is also suitable. In these experiments, only a few adults were obtained, because after a sea voyage of three weeks the *Pistia* plants were already in an advanced state of decay, so that most of the pupae apparently failed to obtain the necessary supply of air and died shortly before the adults could emerge. The possibility of breeding sufficient adults will assist the investigations on *Filaria malayi*.

The characters differentiating *M. annulifera* from *M. indiana* in the various larval instars and as pupae are described in great detail.

The numbers of mosquitos of various species taken on different dates in each month of 1933 and in January 1934 in villages in the delta in which the index of infection with *Filaria malayi* is high are shown in tables. In a village where *P. stratiotes* occurred throughout the year *Mansonia* spp. were found at all times, whereas in another where the marshland was used for rice cultivation, they were replaced by other mosquitos during the second half of the year. If further investigations show an inverse relation between the infection index and the periods when *P. stratiotes* is displaced by cultivated crops, it may be possible to have *Pistia* destroyed.

Papers noticed by Title only.

Macfie (J. W. S.). **Fauna sumatrensis. Bijdrage No. 75, Ceratopogonidae (Diptera)** [including several new species].—*Tijdschr. Ent.* **77** no. 3–4 pp. 202–231, 6 figs. Amsterdam, November 1934.

Macfie (J. W. S.). **Report on a Collection of Ceratopogonidae from Malaya** [including many new species from Malaya, West Java, North Borneo and Sumatra.]—*Ann. trop. Med. Parasit.* **28** nos. 2–3 pp. 177–194, 279–293, 9 figs. Liverpool, July & October, 1934.

Patton (W. S.) & Cushing (E. C.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Genera of the Subfamily Calliphorinae based on a comparative Study of the Male and Female Terminalia. The Genus** *Phormia* **Robineau-Desvoidy** (*sens. lat.*).—*Ann. trop. Med. Parasit.* **28** no. 3 pp. 305–314, 8 figs., 2 refs. Liverpool, 19th October 1934.

da Costa Lima (A.). **Chave para a determinação dos flebotomos americanos.** [A corrected Key (*cf. R.A.E.*, A **20** 161) to the American Species of *Phlebotomus*.]—*Rev. Ent.* **4** no. 4 pp. 427–429. Rio de Janeiro, 31st October 1934.

da Costa Lima (A.). **Applicação de uma technica de Lutz para a montagem da terminalia dos mosquitos.** [The Use of a Technique evolved by Lutz for mounting (in capillary tubes) the Terminalia of Mosquitos.]—*Rev. Ent.* **4** no. 4 pp. 499–501, 4 figs., 2 refs. Rio de Janeiro, 31st October 1934.

Dobrovolny (C. G.) & Ackert (J. E.). **The Life History of** *Leidynema appendiculata* **(Leidy), a Nematode of Cockroaches.**—*Parasitology* **26** no. 4 pp. 468–480, 1 pl., 10 figs., 18 refs. Cambridge, 9th November 1934.

Galliard (H.). **Notes sur la biologie et l'anatomie de la larve de** *Taeniorhynchus* [*Mansonia*] *richiardii* **Ficalbi.**—*Ann. Parasit. hum. comp.* **12** no. 6 pp. 465–471, 5 figs., 3 refs. Paris, 1st November 1934.

Farinaud (E.). **Un exemple de prophylaxie antianophélienne : Tri-cu.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 3 pp. 345–360, 2 figs., 2 charts. Hanoi, March 1934. [Recd. November 1934.] [*Cf. R.A.E.*, B **22** 188.]

Bonne-Wepster (J.). **New Mosquitos (Dipt.) from the Netherlands Indies.**—*Stylops* **3** pt. 12 pp. 272–276, 4 figs. London, 15th December 1934.

Ginsburg (J. M.). **Specifications for Mosquito Oils and Larvicides.**—*Circ. N. J. agric. Exp. Sta.* no. 291, 4 pp. New Brunswick, N. J., December 1933. [Recd. November 1934.]

After discussing the properties necessary in an oil to be used for the control of mosquito larvae, the author gives the following specifications for an oil composed of a mixture of high and low boiling fractions [*cf. R.A.E.*, B **17** 244], which is highly toxic to larvae and yet lasts for 8 days or more ; specific gravity 29–34°Bé. ; flash point, 130–150°F. (P.M.) ; viscosity, 50 or less Saybolt/100 ; boiling range, 10 per cent. 300–400°F., 40 per cent. 400–550°F., and 50 per cent. 550–740°F. This oil can readily be prepared by mixing low grade kerosene or a similar cheap light fuel oil with various proportions of either heavy distillate fuel oil or crank-case waste oil. Generally, about 40–50 U.S. gals. oil per acre are required. The addition of 0·5–1·0 per cent. cresylic acid or similar tar acids will increase the spreading power of the oil ; this may be necessary in places thickly covered with vegetation or débris or on sewage. Where injury to fish, water fowl and aquatic plants must be avoided, an emulsion of kerosene extract of pyrethrum [*cf.* **19** 128] with the following formula may be substituted : 7fl. oz. 20-fold extract (equivalent to 20 lb. pyrethrum flowers to 1 U.S. gal. kerosene) made up to 2 U.S. gals. with kerosene or similar petroleum oil, and then poured gradually with constant agitation into 1 U.S. gallon of an emulsion made with 8 fl. oz. 40 per cent. potassium coconut oil soap and water. This stock emulsion should be well shaken and diluted with 10 parts of water before being applied. The chief disadvantage of this larvicide is that its toxicity does not last for more than 48 hours. If it is applied to water with a salinity of more than 5 per cent., the soap reacts with the salt and the emulsion is broken up ; it must therefore be replaced by powdered skim milk, glue or certain gums, which do not react with salt water. In this case, the extract in kerosene is mixed with 2 oz. cresylic acid or any good cresol disinfectant and added to 15 oz. skim milk or similar emulsifier previously mixed with 1 U.S. gal. water. The cresylic acid is used to prevent the decomposition of the milk. Although this emulsion can be used on both fresh and salt water, soap makes a more stable stock emulsion and in concentrations of 0·1 per cent. or more is itself toxic to mosquito larvae.

Morin (H. G. S.). **Premiers résultats de l'emploi de procédés agronomiques dans la lutte antipalustre en Indochine. Expériences de M. Dupasquier.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 2 pp. 230–244, 2 pls., 2 figs., 1 chart. Hanoi, February 1934. [Recd. November 1934.]

A detailed account is given of experiments begun in 1931 on the control of Anopheline breeding by means of agricultural measures carried out at the Agricultural Experiment Station at Phu-hô, Tonkin, where for various reasons the usual anti-malaria measures could not be undertaken. The malaria vectors are *Anopheles aconitus*, Dön., *A. minimus*, Theo., *A. jeyporiensis* [var. *candidiensis*, Koidz.] and *A. maculatus*, Theo. The chief breeding-places were in canals, whether grass-grown or having stony bottoms, in damp meadows (particularly in hoof-prints), in uncultivated rice-fields, in the strips of marshy ground separating the rice-fields from the hilly ground, and in the shallow, grassy water at the edges of ponds and channels. On the other hand, hardly any larvae were found in rice-fields cultivated

regularly in both seasons, in heavily shaded canals, in marshes covered thickly with bushes and reeds, in low lying land in which leguminous plants cover the entire ground or in deep ponds with clean edges. Malaria is most intense where low land near dwellings is most favourable for mosquito breeding.

The measures carried out were based on the fact that the only economically practicable means of making the region healthy is to adopt such methods of dealing with the low land within about 1,000 yds. of villages that it will yield profitable returns and be rendered unsuitable for Anopheline breeding. To turn it into meadows with open drainage is useless, since the drains soon become grassy, their edges fall in and hoof-prints collect water by seepage. It may, however, be converted into meadows or cultivated fields with subterranean drainage ; in this case there is only one canal to treat. Unfortunately the land is often so water-logged and muddy that partial drying by means of open drains must be effected before subterranean drainage can be installed. Such land may be used for rice-fields provided that the central drain is well-kept, the terracing is carried out so that the higher fields can be completely dried during the winter, no uncultivated strips are left, and all fields that cannot be completely dried are cultivated during both seasons. Only the central drain and some irrigation canals need to be treated. After superficial drying by open drains, the land may be used for growing crops that will shade it all the year round ; certain leguminous green manure plants that can be maintained for 3 years or more absorb large quantities of water, and if they are cut at a height of about 2 feet from the ground, the lower branches continue to keep the soil shaded. Lastly the low land might sometimes be converted into fishponds, but the cost would be high and the returns problematical.

Whatever method is used, there are always canals, drains, springs, etc., to be oiled. At Phu-hô, oiling was carried out every week (except in winter when the interval was extended to 10–15 days), using " Shell " antimalaria oil at the rate of about 1 gal. to ½ mile for small drains (12–20 ins. wide) and 1½ gals. for large drains (32–40 inches wide) when the brush method [*cf.* *R.A.E.*, B **22** 148, etc.] was employed. When the oil was sprayed, much larger quantities were used, and it was necessary to heat the oil or dilute it with kerosene.

The cost of the measures is briefly discussed. Breeding in canals may be prevented by planting bushes along each edge and pruning them so that they entirely shade the canal. A certain amount of screening of houses was also carried out. Although little result was obtained during the first year, the spleen index of children dropped from 100 per cent. in 1931 to 30·3 in October 1933, and the parasite index from 66 to 21 per cent.

Robin (L. A.) & Toumanoff (C.). **Premières notions sur la réceptivité expérimentale de quelques anophèles de la Cochinchine et particulièrement de** *A. vagus*, **Dön.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 2 pp. 245–252, 3 refs. Hanoi, February 1934. [Recd. November 1934.]

The experiments described were undertaken to determine whether the low endemicity of malaria in certain parts of Indo-China, such as the delta regions in Cochin China [*cf.* *R.A.E.*, B **15** 64] and Tonkin [*cf.* **21** 190], is due to zootropism of the Anophelines that occur there

or to some internal condition that prevents the development of the parasites in them. Malaria parasites were found in the salivary glands of the first three and in the stomachs of all of the following species dissected 4–16 days after feeding on infected persons: *Anopheles minimus*, Theo., *A. maculatus*, Theo., *A. vagus*, Dön., *A. kochi*, Dön., *A. leucosphyrus*, Dön., *A. subpictus*, Grassi, and *A. jeyporiensis* [var. *candidiensis*, Koidz.]. Of these species *A. vagus* has rarely been recorded as infected in Indo-China [*cf.* **20** 62], and *A. subpictus* never. *A. vagus* is the predominant Anopheline in the delta region of Cochin China at certain times of the year and has not yet been found infected in that region. Thus it is concluded that low endemicity is attributable to the mosquitos of the region concerned not being infected rather than to the parasites being unable to develop in them.

Monnier (—) & Martin [P.]. **Contribution au contrôle chimique de l'épandage du vert de Paris pour la destruction des larves d'naophèles.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 2 pp. 253–262, 2 pls., 3 refs. Hanoi, February 1934. [Recd. November 1934.]

In view of the importance of being able to check the work of those charged with the distribution of Paris green for the control of Anopheline larvae, the authors describe a technique and apparatus by means of which it is possible to determine the presence and approximate quantity of arsenic present in a given sample of water. The test is based on the fact that arsine (evolved from the arsenic in the water by reaction with pure sulphuric acid and activated zinc) produces on paper sensitised with mercuric chloride a yellow stain that may be fixed by immersing the paper in potassium iodide. Instances of the use of this method in practice are given.

Mathis (M.). **Agressivité et pontes comparées du moustique de la fièvre jaune en conditions expérimentales.**—*C. R. Soc. Biol.* **115** pp. 1624–1626, 6 refs. Paris, 1934.

In the course of rearing *Aëdes aegypti*, L. (*argenteus*, Poir.) in Paris, it was observed that whereas several blood meals were required before oviposition when the mosquitos were fed on rabbit, guineapig or monkey, it was exceptional for more than one to be made on man. In experiments in which adults reared under the same conditions were fed on man, monkey (*Macacus rhesus*), rabbit and guineapig, not only did those fed on man take fewer blood meals, but the average number of eggs laid by each female was higher.

Worsley (R. R. LeG.). **The insecticidal Properties of some East African Plants. I.**—*Ann. appl. Biol.* **21** no. 4 pp. 649–669, 6 refs. Cambridge, November 1934.

In tests in Tanganyika Territory, an alcoholic extract of the seeds of *Tephrosia vogeli* [*R.A.E.*, A **23** 80], used at the rate of 1 in 300, was toxic to mosquito larvae. Since the larvae are surface breathers, the extract may have acted as a stomach poison. Of 10 larvae of *Aëdes* (*Stegomyia*) sp., 8 died after one hour and all after 24 hours. A 10 per cent. kerosene extract [*cf. loc. cit.*] of *Tephrosia* seeds killed all cockroaches sprayed with it in 15 minutes, while a 10 per cent. kerosene extract of pyrethrum killed all in 2 minutes. Moreover, unlike

pyrethrum extracts, the spray will not kill insects unless it actually wets them and is not effective in the form of a fine mist. Against flies and mosquitos it was as effective as pyrethrum provided that the insects were hit by it. Its deficiency in the repellent effect that pyrethrum has after spraying might be remedied by the addition of some substance such as oil of wintergreen.

Earle (W. C.). **Summary of Malaria Activities in Grenada, B.W.I. 1929–1932 inclusive.**—*Rep. med. sanit. Dep. Grenada 1932* pp. 44–52. Grenada, 1933. [Recd. November 1934.]

Investigations on the malaria situation in Grenada were made by the author during visits to the Island in June 1930, May 1931, March 1932 and January 1933. From a survey carried out in 1929 by Dr. F. M. Root, it had been concluded that the malaria rates were extremely low at altitudes above 500 ft. and, as the hills rise abruptly from the sea, the disease was practically confined to a narrow strip round the coast, where its distribution was irregular. An analysis of the 2,600 positive blood smears taken during 1930–1932 confirmed, in general, the findings of the survey, but emphasised the irregular distribution. There does not appear to be any sharp seasonal variation in the incidence of the disease, although it seems to be slightly less prevalent in the spring and rather more prevalent from September to December.

The three species of *Anopheles*, *A. tarsimaculatus*, Goeldi, *A. argyritarsis*, R.-D., and *A. pseudopunctipennis*, Theo., may be found throughout the year. Their seasonal prevalence and breeding-places are discussed. On the west coast, where malaria is not severe, the rivers have a swift current throughout their course, whereas on the north and east coasts they usually have a more or less stagnant pond or lagoon at the mouth, where breeding occurs. Catches at different times of the year indicate that larvae of *A. tarsimaculatus* may be found at some time or other over almost the entire coastal area; in some instances they have been found in pools inland. Mangrove swamps and lagoons at the mouths of rivers formed the main breeding-places of this species, which can live in brackish water. In mangrove swamps it was found in dense shade and among the stubble, where it was protected from the numerous fish, in cacao groves in ditches and pools, which are often covered with large cacao leaves, and in certain pastures among dense grass growing 2–3 feet high. *A. pseudopunctipennis* was most abundant in sunny pools covered with algae in small stream-beds at the lower elevations; it was rare in mangrove swamps, particularly if the water was at all brackish. The adults were never found so abundantly as the larvae. *A. argyritarsis* apparently breeds under the most varied conditions, but it was never very numerous. It was found at altitudes of up to 600 ft., as well as at sea level, and was taken more commonly than the other species on the grassy margins of running streams exposed to sunlight. It also occurred in ravines in stagnant pools shaded by cacao trees and their fallen leaves. At times it has been found in mangrove swamps at sea level, as well as in old volcano craters. As, however, almost any water deposit may be so changed during certain seasons that it is favourable to any of the species, species control is of no great importance.

Observations indicate that *A. tarsimaculatus* has a flight range of at least a mile. A comparison of catches in traps with animal bait and in houses indicated that it is most numerous in the latter. The adults,

particularly the males, rest among sticks, twigs, etc., above the water in mangrove swamps, and the frequency with which they are found often indicates the importance of a given breeding-place. The other two species were caught in houses only in small numbers and only during June and July 1932, but they were more numerous in traps and the catches were in closer accord with observations on the larvae. Adults of *A. pseudopunctipennis* were occasionally observed in shady parts of the ravines in which breeding was taking place. Experiments with traps baited with animals and men showed that *A. tarsimaculatus* prefers to feed on man. Of mosquitos that engorged in a trap containing men and a donkey, the percentages that fed on man were 59, 24 and 18·5 for *A. tarsimaculatus*, *A. pseudopunctipennis* and *A. argyritarsis* respectively. Dissections of females of *A. tarsimaculatus* taken in houses and traps in endemic areas gave a sporozoite rate of 0·5 and an oöcyst rate of 1·1 per cent. A few experiments demonstrated that *A. argyritarisis* is easily infected, whereas *A. pseudopunctipennis* is infected only with difficulty. For this reason and because it is little attracted to feed on man, seldom seems to be very abundant and is most numerous at a time when the malaria incidence is relatively low, the latter species can probably be disregarded as a vector. *A. argyritaris* may be a supplementary vector, but as *A. tarsimaculatus* is likely to breed in all places where *A. argyritaris* is found, the question is of little importance from the point of view of control.

The various control measures that would appear to be most suitable in the localities most affected by malaria are discussed; they include drainage, canalisation of ravines, filling, dusting with Paris green, etc.

MORGAN (L. S.). [**Report on Malaria Control in Grenada 1932.**]—*Rep. med. sanit. Dep. Grenada 1932* pp. 53–55. Grenada, 1933. [Recd. November 1934.]

In April 1932, field observations, which had previously been confined to the region of Grenville, were extended to other areas. Data on the numbers of Anopheline larvae and of adults caught in traps throughout the year are given in tables. Catches of adults made in houses did not cover a period exceeding 8 months, but the species taken was invariably *Anopheles tarsimaculatus*, Goeldi, and the numbers caught greatly exceeded those taken in traps. Contrary to the experience of workers elsewhere, this species seems to remain in houses after obtaining blood meals.

BRÁS DE SÁ (L. J.). **Meios práticos de combater a Malária em Gôa.** [Practical Measures for combating Malaria in Goa.]—*Arq. Esc. méd-cirurg. Nova Goa* (B) no. 5 pp. 1212–1284, illus., 53 refs. Nova Goa, 1934.

The author surveys the various measures employed against Anophelines and malaria and discusses those considered suitable for use in Goa.

TOUMANOFF (C.). **Caractéristique des représentants du "rossi-ludlowi" groupe de l'Indochine. Première note:** *A. subpictus* **Grassi.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 7 pp. 657–673, 10 figs., 3 refs. Hanoi, 1934.

The author records the results of a study of the forms of *Anopheles subpictus*, Grassi, from Cochin China and Tonkin and concludes that

they should be referred to var. *indefinitus*, Ludl. The larvae from both areas and the adults from Tonkin more closely resemble var. *indefinitus* as occurring in the Philippines [*R.A.E.*, B **20** 93] than the typical form, although the adults from Cochin China show characters intermediate between the two. Although the differentiation of the Tonkin form of *A. subpictus* from *A. vagus*, Dön., may sometimes be difficult, particularly if it is based on the alar characters of the females, the latter may be distinguished by the ratio of black to white on the palps (when it is lower than 0·30 the example is probably *A. vagus*, when it is 0·34 or higher it is probably *A. subpictus*), and the males by the leaflets of the mesosome, which are longer and stronger in *A. vagus*.

The fauna of the low maritime zone of Tonkin has only been studied in three localities of the Province of Nam-dinh, the Anophelines taken being *Anopheles hyrcanus* var. *sinensis*, Wied. (508 larvae, 257 adults), *A. vagus* (296 larvae, 436 adults), *A. subpictus* var. *indefinitus* (415 larvae, 97 adults), *A. philippinensis*, Ludl. (4 adults) and *A. barbirostris*, Wulp (1 larva). As the localities were malarious, the identity of the form of *A. subpictus* was of particular interest in that it was suspected of being the vector of malaria. This species constituted 75·84 per cent. of the Anopheline fauna during the summer monsoon (May-September), 19·4 per cent. in April and September, and 9·59 per cent. in November and March. The breeding-places in this zone consist in almost all cases of pools several yards in diameter and deep in places, with or without grassy margins and containing water that is generally dirty and stagnant. Usually the pools are fed by ditches (communicating with the numerous canals), which themselves constitute favourable breeding-places for certain species. Breeding also occurs in large surfaces of water, sometimes fairly clear, covered at the edge with grass or Japanese lotus. The breeding-places are so similar that the distribution of each particular species in them was not studied. The salinity of the water varies considerably (either through proximity to salt deposits or owing to the action of the tides), and *A. subpictus* has been found in water in which the salt content ranged from 0·2–15 parts per mille.

MOREAU (P.). **Notes sur un voyage d'études malariologiques dans l'Océan Indien.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 7 pp. 674–703, 3 pls. Hanoi, 1934.

The author describes the situation regarding malaria and Anophelines and the control measures and research work that is being carried out in Java, Mauritius, Réunion and South Africa on the basis of information obtained while visiting these places.

JOLLY (G. G.). **Report on the Mosquito Survey of Rangoon.**—Fol., 55 pp., 1 fig., 2 maps, 7 graphs in pocket. Rangoon, Supt Govt Ptg, 1933. [Recd. December 1934.] Price 7*s*. 6*d*.

Although malaria is practically absent from Rangoon, dengue is endemic with periodic epidemics, and mosquitos are present in such large numbers throughout the year that they are a constant source of annoyance. For these reasons, a detailed mosquito survey of the greater part of the town was made during April–November 1930, and the results are given in this paper. After briefly describing the town,

its population, water supply, vegetation, fauna (particularly fish) and climate, the author gives information on the mosquitos, showing their seasonal incidence, types of breeding-places and distribution. The 36 species taken included *Aëdes aegypti*, L. (*argenteus*, Poir.) and *A. albopictus*, Skuse, which transmit dengue, *Culex fatigans*, Wied., *Anopheles barbirostris*, Wulp, *A. annularis*, Wulp (*fuliginosus*, Giles), *A. hyrcanus* var. *nigerrimus*, Giles, *A. splendidus*, Koidz. (*maculipalpis*, var. *indiensis*, Theo.), *A. tessellatus*, Theo., and *A. vagus*, Dön. Suggestions are made regarding the anti-larval measures that should be carried out, the organisation of the work, the education of the populace in order to obtain their co-operation, and the enactment of legislation to permit the enforcement of regulations.

DE BUCK (A.) & SWELLENGREBEL (N. H.). **Further Observations on the Pattern of the upper Surface of the Ova in the Dutch Varieties of** *A. maculipennis*.—*Proc. Acad. Sci. Amst.* **37** no. 8 pp. 578–579, 1 pl., 1 ref. Amsterdam, 1934.

In view of the importance of the design on the dorsal surface of the eggs in distinguishing the various races of *Anopheles maculipennis*, Mg. [*cf. R.A.E.*, B **22** 200], the authors give further information on the appearance and structure of the columellae [**21** 137] in *A. maculipennis* var. *maculipennis* (*typicus*), var. *atroparvus*, van Thiel, and var. *messeae*, Flni., from Holland and in var. *labranchiae*, Flni., from Italy. The aspect of their upper surface may prove particularly useful in differentiating the eggs of the last two varieties.

SWELLENGREBEL (N. H.) & [NIJKAMP] NYKAMP (J. A.). **Observations on the Invasion of the Wieringermeerpolder by** *Anopheles maculipennis*.—*Quart. Bull. Hlth Org. L.o.N.* **3** no. 3 pp. 441–460, 4 maps, 1 chart. Geneva, September 1934.

A detailed account is given of investigations on the short-winged race of *Anopheles maculipennis* [*atroparvus*, van Thiel] carried out from 1931 to 1933 in an area near Medemblik reclaimed from the sea in 1930. Some of the information has already been noticed [*R.A.E.*, B **22** 198].

Breeding in the new polder was impeded by the high salinity of the water (average in 1931 8 gm. Cl per litre); consequently most of the adult Anophelines came from old land, particularly the environs of Medemblik. The favourable influence in the polder of the anti-larval operations in Medemblik was apparent from the great increase in numbers of adults found in the former area in 1932 when these measures were discontinued, the number of breeding-places within the polder having increased very little. The invariable presence of males as well as females in experimental pig-sties that were situated about 2 and 3 miles respectively from the nearest point of the old land contradicts the view that the presence of males indicates proximity to breeding-places.

In the two villages built in the reclaimed area since June 1932 there are no animals, except poultry and rabbits. A comparison of the numbers of Anophelines in animal quarters and dwellings in 1933 showed that whereas the ratio was 4 to 1 in the polder, it was over 400 to 1 in and around Medemblik (where the stables contained pigs, horses, cattle and goats), so that the chance of an Anopheline re-entering a

house on its return from breeding-places is one hundred times greater in the polder and the chance of its transmitting malaria in the summer is increased in the same proportion. Two cases of malaria did in fact occur in the new polder at the end of August 1933, but the activity of the inhabitants in systematically destroying adults in houses and animal quarters by means of pyrethrum insecticides [*cf.* **22** 197] prevented the disease from spreading and reduced the average number of Anophelines found in houses from 23 in August to 2 in September (the average for the same periods being 18 and 31 in the new polder in 1932 and 24 and 26 in Medemblik in 1933). At times when there was no particular cause for alarm, no prophylactic measures were taken by the inhabitants except the more or less regular killing of Anophelines in bedrooms, and the efficacy of this measure has been regarded with doubt. However, the systematic capture of Anophelines in houses by the authors aroused the interest of the inhabitants, and whereas during the first inspection of the houses in 1933, 13 Anophelines were captured in each house and 44 per cent. were taken in bedrooms, on the second inspection the average per house had dropped to 3 and the percentage in bedrooms to 21 ; on the third inspection the average per house had risen to 32, but the percentage taken in bedrooms had decreased still further to 8. The expectation that the number of Anophelines containing human blood would be higher in the new polder than in Medemblik, where animal deviation occurred, was confirmed during the first inspection in 1933 when 60 per cent. were engorged with human blood as compared with an average of 16 per cent. for all inspections in Medemblik. On the remaining inspections, however, the percentage in the new polder had fallen to an average of 13 owing to the destruction of the Anophelines in the bedrooms, where they were most likely to feed on man. The high salinity of the water may be expected gradually to reach normal, and unless stables in sufficient numbers to induce animal deviation of the Anophelines are established at the same time, the malaria incidence in the reclaimed area is likely to become higher than in the old land.

WEYER (F.). **Ueber den Cl-Gehalt und das pH verschiedener Brutgewässer von *Anopheles maculipennis* in Norddeutschland und die Beziehungen zur Rassenfrage.** [On the Cl Content and the pH of various Breeding Waters of *A. maculipennis* in North Germany and their Connection with the Question of Races.]—*Arch. Hydrobiol.* **27** no. 4 pp. 595–608, 3 figs., 13 refs. Stuttgart, 1934.

The following is taken from the author's summary. An investigation in northern Germany showed the chlorine content of the water in typical breeding-places of *Anopheles maculipennis*, Mg., in East Friesland to vary from 0·034 to 0·661 per mille and the pH from 6·8 to 8·2. In Mecklenburg the Cl content sometimes reached 3·0 per mille. The Cl content of breeding waters in the districts in which the race *atroparvus*, van Thiel, occurs is considerably lower in Germany than in Holland. The breeding-places in the range of this race include fresh waters in northern Germany, while the eggs of *messeae*, Flni., sometimes occurred on brackish water [*cf. R.A.E.*, B **22** 244]. Eggs of typical *maculipennis* also occurred on these fresh-water and brackish pools. There is no close correlation between the presence of a particular race and the Cl content of the breeding-place.

GIRAUD (P.). **A propos de la transmission de la leishmaniose interne. Fréquence de l'atteinte par les tiques des jeunes enfants de la région méditerranéenne.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 731–733, 2 refs. Paris, 1934.

One of the arguments against the transmission by ticks of the form of visceral leishmaniasis that occurs in the Mediterranean Basin, including Marseilles [*cf. R.A.E.*, B **21** 138], is that, although the disease is prevalent among young children and even babies, ticks rarely attack young children and their bite is so painful that it would not escape the attention of relatives. The author points out, however, that Marseilles fever, which is known to be transmitted by *Rhipicephalus sanguineus*, Latr., not only occurs among children, but out of 67 cases tick bites were reported by parents in 12 only. Moreover, living ticks have been found on children after parents had said that they had observed no bites.

ROUBAUD (E.). **Un type racial nouveau de l'*Anopheles maculipennis*.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 737–740, 1 pl., 5 refs. Paris, 1934.

Anopheles maculipennis race *fallax*, n., is described from Normandy. This is the stenogamic race that was used in a pairing experiment [*R.A.E.*, B **21** 122] and has been referred to by the author as " type *atroparvus* " from Normandy [**22** 138]. The speckled black eggs have large floats and, although there are no bars or bands, slightly lighter reflections in the form of irregular spots occur over the entire chorion in certain lights. These spots are much less obvious than those in the irregularly dappled eggs of the races *labranchiae*, Flni., and *atroparvus*, van Thiel. The float index [**21** 211] is in the neighbourhood of 0·4. The air chamber is smooth and faintly striated longitudinally. These characters remained constant through a number of generations ; no barred or pure black eggs were obtained, but occasionally the eggs were lighter in colour. In the larvae, the hairs on the second abdominal segment were branched, not palmate, but the branches on these hairs and on the antepalmate hairs of the 4th and 5th segments were less numerous (average 5–6) than in the Dutch race *maculipennis* (*typicus*) or the Italian race *messeae*, Flni. The number and form of the harpagonal spines [**21** 195] are also similar to those of the *messeae-maculipennis* group, there being two ventral external spines of which one has a blunt tip. The adults are homodynamic, but differ from the *messeae-maculipennis* group in being stenogamic. They are multidentate, breed in fresh water, and are easily crossed with the race *maculipennis*.

TOUMANOFF (C.) & HU (S.). **Premières données sur la zoophilie de *A. hyrcanus* var. *sinensis* en Chine (région de Shanghai).**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 741–745, 2 refs. Paris, 1934.

In certain regions of China, particularly in the neighbourhood of Shanghai and Nanking, *Anopheles hyrcanus* var. *sinensis*, Wied., is the only Anopheline known [*cf. R.A.E.*, B **22** 178, 240], and must therefore be the vector of malaria. The percentage of infection appears, however, to be low [**22** 240], and in order to determine whether this is due to animal deviation, precipitin tests were carried out with anti-buffalo, anti-human and anti-dog sera on 300 examples of this

mosquito caught in stables in a locality where the malaria incidence is low. Out of 299 mosquitos giving positive reactions, 295 had fed on buffalo and the other 4 gave mixed buffalo and human reactions. With 35 additional mosquitos tested with the same sera and with anti-pig serum, the reactions with the anti-buffalo serum were invariably positive.

TOUMANOFF (C.). **Observations sur les habitudes trophiques des anophélines de la colonie de Hong-Kong.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 745–749, 2 pls., 1 ref. Paris, 1934.

In the course of reports on the work of the Malaria Bureau, Hong Kong, for 1932 and 1933, Dr. [R. B.] Jackson gives the results of dissections of mosquitos caught in two villages, one of which was inhabited by temporary workers and the other by a stable population. From the first locality, in which malaria was epidemic, 2,155 *Anopheles minimus*, Theo., 10,936 *A. jeyporiensis*, James, 230 *A. maculatus*, Theo., and 2,818 *A. hyrcanus*, Pall., were dissected and the percentages infected were 12·48, 9·93, 3·48 and 1·21, respectively. From the second locality, in which malaria was endemic, 1,185 *A. minimus*, 3,707 *A. jeyporiensis*, 187 *A. maculatus* and 176 *A. hyrcanus* were dissected and the percentages infected were 3·63, 3·21, 0 and 0.

As these facts could not be explained by differences in external conditions, which in both places were suitable for the development and breeding of the Anophelines, the author considered that animal deviation might account for the low infection in the second locality and undertook a series of precipitin tests with engorged mosquitos from both localities and from a third on the Island of Hong-Kong. In the first locality, there are no animals except a few dogs and goats. In the second, domestic animals are numerous and the cattle-sheds and pigsties are well built. In the third locality, where most of the domestic animals are pigs, the sties have low walls and high roofs supported on pillars, and no Anophelines were caught in them. The results, which are given in a table, show that in the first locality 89 per cent. of the mosquitos had fed on man and even among the 47 examples of *A. hyrcanus* var. *sinensis*, Wied., 43 contained human blood. In the second locality, among 92 mosquitos of different species taken particularly in stables, only 7 had fed on man, 23 examples of *A. minimus* out of 26 containing buffalo blood. In the third locality, 103 out of 126 mosquitos had fed on man. Thus these preliminary observations indicate the important influence on the local incidence of malaria of animal deviation, which is dependent on the numbers of animals present and on the manner in which they are housed.

TREILLARD (M.). *Myzomyia minima* **Theobald, doit-elle être appelée** *Myzomyia vincenti* **Laveran?**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 750–751. Paris, 1934.

The author, who considers that there is no reasonable doubt as to the identity of *Anopheles vincenti*, Lav., with *A. minimus*, Theo., discusses the dates of publication of the descriptions of these two species and concludes that the first name has priority.

Treillard (M.). **Tableau synoptique pour la détermination rapide des Anophèles d'Indochine. I. Adultes.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 751–753, 1 diagr. Paris, 1934.

The author has devised a synoptic table with explanatory diagrams, small enough to be put on a post-card, by means of which it is possible to identify from living examples the species of Anophelines found in Indo-China.

Treillard (M.). **Une modalité de la zoophilie anophélienne en Indochine méridionale : *Neocellia fuliginosa* à la station d'altitude de Dalat (Annam). Points de vue biologique et antipaludique.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 754–756, 2 pls. Paris, 1934.

It is now generally admitted that the transmission of malaria by a given species of Anopheline depends on its food-preferences rather than on its ability to become infected by the *Plasmodium*. At Dalat, a town situated at an altitude of more than 4,500 feet in the mountains of Annam, mosquito breeding-places are numerous, and during the dry season larvae of *Anopheles annularis*, Wulp (*fuliginosus*, Giles) are abundant. Day and night searches failed, however, to reveal the presence of adults of this species in dwellings, whether native or European. On the other hand, cattle-sheds, which were numerous round the town and in the adjacent villages, harboured large numbers although they were badly built and were imperfect shelters. In attempting to explain this persistent food-preference, it must be remembered that *A. annularis* is a species common in mountain regions and is able to withstand relatively low temperatures ; moreover, the dwellings at Dalat are shut up, particularly at night, and the crevices in the native huts are carefully stuffed on account of the cold, so that mosquitos have difficulty in gaining an entrance. The author suggests that this has resulted in the establishment of a zoophilous race, which does not, however, require the conditions of shelter and warmth that would be necessary for other species, particularly in such a climate. That the adults would enter houses if stables were not present is indicated by the finding of a few examples in new buildings inhabited only by caretakers and situated at some distance from stables.

Mathis (M.). **Influence du NaCl sur le déterminisme de la ponte chez un moustique côtier du Var *Aëdes desbansi* Seguy 1932.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 757–759, 4 refs. Paris, 1934.

In two series of experiments, undertaken in Toulon and Paris in 1934, *Aëdes mariae*, Ed. & Et. Serg. (*desbansi*, Séguy), which breeds in rock-pools on the coast of Var, laid the largest numbers of eggs in water containing 30 parts sodium chloride per mille and almost as many in fresh water, whereas few were deposited in water containing 60 parts per mille and practically none in that containing 100 parts per mille.

Chabrillat (M.). **Note sur la fièvre de trois jours.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 762–766. Paris, 1934.

The author describes a three-day fever, outbreaks of which occurred in a ship cruising in the Indian Ocean during 1931 and 1932. A few examples of *Phlebotomus* were found on board, but only when the ship was in dry-dock in Madagascar. Numerous Culicines, among which

Aëdes aegypti, L. (*Stegomyia fasciata*, F.) predominated, were present on board at all times, even when the ship was at sea, the water-tank being an important breeding-place. If the mosquitos were the vectors of the disease, the fact that cases continued to occur when the vessel was at sea can be explained. This hypothesis appears the more probable in that cases ceased after the ship had been sprayed with fly-tox.

HASCHEN (E.). **Versuche zur Bekämpfung des Dasselbefalls beim Rinde. VI. Beitrag. Hexaliquid, Pyrethron, Sulfoliquid, Dasselfluid nach Dr. Herbig, Medol, Petroleum + Paraffinöl āā, Warble-Oil, Cerofob-Salbe, Injektion von Dasselsalbe Gattinger, Dasselsalbe Bengen, Larfugsalbe und Vaseline in die Beulen.** [Experiments in the Control of Warble Infestation in Cattle. Contribution VI.]—Inaug.-Diss. tierärztl. Hochsch. Hannover 35 pp., 14 refs. Hanover, 1933.

The experiments described in this thesis were made at Hanover in 1932 and 1933 to test the value of various preparations against larvae of the ox warble-fly [*Hypoderma*]. A brief survey of the German literature on treatment of warbles is given, and the results of tests made first with living larvae removed from cattle and then on infested cattle are tabulated. Rubbing in liquids and ointments was of no practical value. Injected ointments killed the larvae, but required time and skill to apply, and pure vaseline proved almost as effective. Tests on larvae removed from cattle gave no indication of the efficiency of the materials under natural conditions.

REMIEN (A.). **Versuche zur Bekämpfung des Dasselbefalls beim Rinde. VII. Beitrag. Derrispräparate.** [Experiments in the Control of Warble Infestation in Cattle. Contribution VII. Derris Preparations.]—Inaug.-Diss. tierärztl. Hochsch. Hannover 47 pp., 13 refs. Hanover, 1933.

A detailed account is given of experiments in North Germany made to ascertain the effectiveness of various derris preparations against the larvae of warble-flies [*Hypoderma*] infesting cattle, and the possibility of making a standardised stock extract only requiring dilution with soap solution or water. The literature on the use of derris against *Hypoderma* is briefly surveyed. In the 519 experiments 398 cattle with 6,070 warbles were used. Treatment carried out in the first half of February was rendered ineffective by new infestations, but treatment in the second half of April, shortly before placing the animals on the pastures, gave satisfactory results.

The results of several commercial preparations are compared with those of a wash consisting of 10 lb. ground Singapore derris roots (rotenone content 6·8 per cent.), soaked in 9 gals. water, to which 1 gal. 25 per cent. soap solution was added. From 7 to 10 fl. oz. of this wash, according to the size of the animal and the thickness of its coat, were shaken out of a bottle on to its back and then spread and thoroughly rubbed in by hand, the warble crusts being removed to allow the insecticide to reach the larvae. The application took only a few minutes, did not disturb the animals, and caused no irritation of the skin. One application destroyed 98·6 per cent. of the larvae (1,160 out

of 1,177). Twelve larvae resulting from later infestations were easily removed mechanically. Other animals received a second application 3 days after the first, and all the 888 larvae were destroyed.

It was found that many useless preparations are on the market, so that the importance of standardised preparations is evident. The content in rotenone and other extractives should be stated. A much smaller amount of standardised extract than of derris powder is required to prepare a given quantity of wash It was also found that while solutions of pure rotenone were very active, they were less so than solutions of total extract. Solutions containing a high percentage of all the extractives except rotenone, or with only a trace of rotenone, destroyed 99·7 per cent. of the warbles.

ZUNKER (M.). **Die Abtötung von Dassellarven mit Derris-Extrakten.** [Killing *Hypoderma* Larvae with Derris Extracts.]—*Berl. tierärztl. Wschr.* **50** no. 14 pp. 243–246, 1 fig., 12 refs. Berlin, 6th April 1934.

General notes on derris, methods of assaying the roots and the advantages of biologically tested extracts are followed by an account of some comparative tests against warble-fly larvae [*Hypoderma*] with different preparations of derris as washes [see preceding paper]. The amount of liquid used per animal was 3½–7 fl. oz. and application took about a minute. The control obtained varied widely (33 to 98·6 per cent.). Prolonged brushing did not materially improve the effect.

PETER (—). **Beitrag zur experimentellen Erzeugung anaphylaktischer Zustände bei Rindern mit dem Gewebssaft von Hypodermenlarven** [The experimental Production of anaphylactic Conditions with Extract of *Hypoderma* Larvae.]—*Berl. tierärztl. Wschr.* **50** no. 14 pp. 241–243, 6 refs. Berlin, 6th April 1934.

Symptoms of urticaria in cattle and sometimes acute general disturbances leading to death have been observed to follow injury to larvae of *Hypoderma* infesting them. In 1927, the author injected cattle subcutaneously with an extract from fully grown larvae, and the results showed that in all cases symptoms of anaphylaxis were produced.

GÖTZE (R.). **Verluste und Erkrankungen bei der Abdasselung durch Dasselanaphylaxie.** [Losses and Sickness due to Warble Anaphylaxis in Warble Control.]—*Dtsch. tierärztl. Wschr.* **42** no. 17 pp. 258–260, 7 refs. Hanover, 28th April 1934.

The clinical appearance of anaphylaxis produced by *Hypoderma*, which occurs in cattle over 3 years old is described. The urticarial inflammation seen in spring is considered to be due to natural warble anaphylaxis. In order to avoid unnecessary losses, it is advised that animals over 2½–3 years old should be provisionally exempted from the warble treatment compulsory in Germany, and that younger animals should be thoroughly treated with derris. Poisoning by derris is not the cause of the trouble.

Beeuwkes (H.), Mahaffy (A. F.), Burke (A. W.) & Paul (J. H.). **Yellow Fever Protection Test Surveys in the French Cameroons, French Equatorial Africa, the Belgian Congo, and Angola.**—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 3 pp. 233–258, 4 maps, 4 refs. London, November 1934.

The protection test surveys that are being carried out to determine the incidence of yellow fever in Africa [*R.A.E.*, B **22** 173] have been further extended [*cf.* **22** 176], and the present paper records the results of work carried out in French Kamerun, French Equatorial Africa, the Belgian Congo and Angola, when 4,828 specimens of sera from 108 towns were examined.

The following is taken from the authors' summary: Except in the interior of French Equatorial Africa, the percentages of positive sera obtained in these colonies were much lower than in those previously surveyed [**22** 173], probably owing to the fact that conditions in this region are relatively unfavourable for the maintenance of yellow fever infection. Although extensive epidemics have occurred in some parts, the disease seems to be nowhere endemic. It has never been reported from French Equatorial Africa, but positive findings in the interior showed that extensive epidemics had occurred within recent years as well as in the more distant past, and that there is no barrier in this region to the spread of yellow fever into East Africa. Findings in the coastal area of this Colony indicate that although a certain amount of yellow fever has occurred in the past, the incidence has been practically negligible in recent years. The completely negative findings among sera from Duala and the low percentage of positive results in general among the sera of children in French Kamerun suggest that yellow fever was not introduced into French Equatorial Africa through this Colony. Regarding the Belgian Congo, the findings in the lower Bas Congo indicate that the yellow fever epidemic of 1927–28 involved more towns than the two (Matadi and Boma) in which the disease was recognised. The epidemic was not particularly extensive, however, as the Mayumbe appear to have escaped infection, and findings in Leopoldville and the interior indicate that the disease did not gain a foothold there. Though in the past yellow fever occurred in the latter region, it seems to have been almost completely absent during recent years. Results from towns along the Congo and Ubangui Rivers suggest that infection may have been carried into the interior of French Equatorial Africa by means of river traffic. The practically negative findings in the south and south-eastern portions of the Belgian Congo and throughout Angola indicate that the limits of the distribution of yellow fever in these directions have been reached.

Schwetz (J.). **Note supplémentaire sur la répartition des Glossines dans la forêt de l'Ituri (Province orientale, Congo belge).**—*Rev. Zool. Bot. Afr.* **25** fasc. 4 pp. 385–388, 1 fldg map. Brussels, 30th November 1934.

The author gives an account of the distribution of tsetse-flies in the Forest of Ituri, one of the areas of the Eastern Province of the Belgian Congo that he had previously [*R.A.E.*, B **19** 104] been unable to study. *Glossina palpalis*, R.-D., occurs along all the rivers throughout the forest, but never in such large numbers as along the rivers in the savannah regions. This may possibly be due to the fact that the river banks in the forest are more marshy and therefore less suitable for the

development of the pupae. *G. fusca*, Wlk., is ubiquitous, though rare in certain spots and numerous in others. *G. tabaniformis*, Westw., was found in association with *G. fusca*, but is much more rare and does not seem to have reached the eastern part of the forest. *G. newsteadi*, Aust., was taken in two localities, showing that it is not confined to Bas-Lomami as was previously suspected [*loc. cit.*]. *G. fuscipleuris*, Aust., and *G. severini*, Newst., were not observed; although they were described from examples obtained in this region, they appear to be extremely rare there.

McIndoo (N. E.). **Chemoreceptors of Blowflies.**—*J. Morph.* **56** no. 3 pp. 445–475, 10 figs., 13 refs. Philadelphia, Pa, 5th December 1934.

The following is substantially the author's summary: This paper deals with the morphology of all the so-called gustatory and olfactory organs of blow-flies, and describes tests to determine whether these insects taste with their tarsi and smell with their antennae and palpi. The antennae bear two types of so-called olfactory hairs, while the palpi bear only one. With the aid of an olfactometer, it has been shown that the antennae and palpi do not bear the olfactory organs.

In order to explain the proboscis response described by Minnich [*R.A.E.*, B **14** 223], it is not necessary to assume that the tarsi bear gustatory organs. A tarsus bears no sense organs, except nine olfactory pores, and it is almost impossible to wet it with water or sugar water. Moreover, when liquids were about 3 mm. from the tarsi the flies were induced by a special method to exhibit the proboscis response. It was further demonstrated that the tarsi can easily distinguish between chemically pure saccharose water and distilled water when these liquids are about 3 mm. from them. The responses, obtained by any method, are caused by two stimuli, one mechanical and the other olfactory. The act of touching produces the initial stimulus and brings the liquids almost in contact with the olfactory pores on the tarsi.

Macy (R. W.). **Studies on the Taxonomy, Morphology, and Biology of** *Prosthogonimus macrorchis* **Macy, a common Oviduct Fluke of Domestic Fowls in North America.**—*Tech. Bull. Minn. agric. Exp. Sta.* no. 98, 71 pp., 11 pls., 1 fig., 2 graphs, 5 pp. refs. St Paul, Minn, 1934.

For many years, owners of fowls in the lake regions of Minnesota have noted a sharp decline in egg production in early summer and a tendency for the few eggs laid to be soft-shelled or otherwise malformed. Many adult birds die during this season, particularly those having access to swampy ground and to shores of lakes with much vegetation. The cause has been found to be infestation with a Trematode parasite of the genus *Prosthogonimus* [*cf. R.A.E.*, B **15** 62], the species chiefly concerned in North America having recently been described by the author as *P. macrorchis*. In the present paper the results of his observations on the taxonomy, morphology, biology and economic importance of this species are given. It has so far been recorded only from the region of the Great Lakes in Canada and the United States. Ducks appear to be the normal definitive hosts in nature, fowls being less favourable since the fluke injures them and is lost in 3–5 weeks. Of 1,227 examples of the snail, *Amnicola limosa porata*, examined between 14th August and 5th November 1933, 2·7 per

cent. were infested with sporocysts and cercaria and a species of *Prosthogonimus*, presumably *P. macrorchis*. The snails frequently travel along the bottom of the lake, a habit that would facilitate their eating the eggs, which, if they resemble those of certain other Trematodes, must be eaten in order to hatch.

A survey made in 1932 and 1933 of the adults and nymphs of dragonflies in Minnesota revealed the presence of metacercaria of *P. macrorchis* in species of *Leucorrhinia*, *Tetragoneuria*, *Epicordulia* and *Mesothemis*, the average number of cysts found in naiads from a certain lake being 10·4, 8·4, 11·0 and 0·29 respectively. The habits of dragonflies of these genera are briefly described. In addition, naiads of *Libellula luctuosa*, Burm., contained what appeared to be partly developed cysts of *Prosthogonimus*, though no flukes were produced when ducks were fed on them. Dragonflies of the genus *Epicordulia*, of which the species concerned is *E. princeps*, Hagen, have a two year life-cycle and so are exposed to infestation for two seasons. The naiads of the other species are exposed to infestation during the summer and autumn of one year and the spring of the following year. In late May and early June, hordes of naiads of the above mentioned genera collect in the shallow water, climb the stems of plants and transform into adults. Many kinds of birds gorge themselves at this time on both naiads and adults. The development of the parasite within the dragonfly host is described.

The following is taken from the author's summary of the life-cycle: The sporocyst in the snail produces the cercaria (there being no redia stage), which swims away. If it is drawn by breathing movements into the anal opening of a suitable species of dragonfly naiad, its tail is lost and the metacercaria formed makes its way into the muscle, where it increases in size and eventually becomes encysted. If the infested dragonfly naiad or adult is eaten by a suitable avian host, the wall is dissolved off the cyst as it passes down the digestive tract, and the worm makes its way down the intestine to the cloaca and then to the bursa Fabricii or the oviduct, where it completes its development. The embryonated eggs produced by it leave the bird by the cloacal opening, and if they reach a lake inhabited by *Amnicola*, the latter becomes infested and sporocysts develop.

Since the transfer of *P. macrorchis* is undoubtedly through naiads and adult dragonflies only, poultry should be kept away from the shores of lakes. This is not necessary in the case of temporary ponds or streams, which do not apparently harbour suitable intermediate hosts. Fowls should be kept closely confined when dragonflies are emerging in large numbers in May and June. Adult dragonflies are easily captured by poultry on damp mornings, and the latter should not be turned loose until the former have risen from the weeds. As crows and English sparrows have been shown experimentally to be capable of harbouring mature examples of *P. macrorchis*, these birds probably serve as reservoirs for the fluke and a reduction in their numbers would tend to restrict its distribution.

Donat Wood (F.). **Natural and Experimental Infection of *Triatoma protracta* Uhler and Mammals with American Human Trypanosomiasis.**—*Amer. J. trop. Med.* **14** no. 6 pp. 497–517, 3 pls., 12 refs. Baltimore, Md, November 1934.

The author records the results of investigations carried out over a period of 4 years on the biology of *Trypanosoma cruzi* found in the

digestive tract of *Triatoma protracta*, Uhler, from the nests of a wood rat, *Neotoma fuscipes*, in California [*cf. R.A.E.*, B **21** 138]. The finding of the trypanosome in blood from the heart of one of these rats shows that they harbour it in nature. In addition to the animals already mentioned [*loc. cit.*], monkeys (*Macacus rhesus*) and various small rodents have also been infected by experimental inoculation.

Gordon (W. S.). **Recent Advances in the Control of certain Diseases of Sheep.**—*Vet. J.* **90** no. 11 pp. 439–446, 11 refs. London, November 1934.

In the course of a brief popular account of certain diseases of sheep in Britain, the author deals with louping-ill and tick-borne fever, both of which have been shown to be transmitted by *Ixodes ricinus*, L. [*cf. R.A.E.*, B **21** 58, etc.].

Pijper (A.) & Dau (H.). **Die fleckfieberartigen Krankheiten des südlichen Afrika.** [The Typhus-like Diseases of southern Africa.]—*Zbl. Bakt.* (1 Orig.) **133** no. 1–2 pp. 7–22, 51 graphs, 62 refs. Jena, 20th November 1934.

The authors find that three distinct diseases of the typhus group occur in South Africa. One of these is tick-bite fever [*cf. R.A.E.*, B **19** 181; **22** 17], which is not the same as Marseilles fever. In experiments on this disease in Pretoria crushed larvae of *Rhipicephalus appendiculatus*, Neum., that had been collected from a man, already immunised but covered with bites, were injected intraperitoneally into a guineapig. The latter showed a typical fever curve and 6 weeks later proved immune from tick-bite fever, whereas the control reacted typically. Other larvae of *Rhipicephalus* from the same man showed numerous rickettsiae in the Malpighian tubes. Similar experiments with larvae, nymphs and adults of *Hyalomma aegyptium*, L., produced fever in a guineapig but no immunity, an observation indicating the need for caution in considering such fever curves in guineapigs.

Reichenow (E.). **Beiträge zur Kenntnis der Chagaskrankheit.** [Contribution to the Knowledge of Chagas' Disease.]—*Arch. Schiffs- u. Tropenhyg.* **38** nos. 11–12 pp. 459–477, 499–518, 6 figs., 2 pp. refs. Leipzig, November-December 1934.

The major part of this paper is a record of observations on Chagas' disease made in Guatemala in 1932. *Triatoma dimidiata*, Latr., the only Triatomid found by the author, was very common in the huts of mud and wood and in the walls of houses in provincial towns. It was not seen out of doors or in flight, and it is suggested that the larvae and nymphs never leave the dwellings, and that a nuptial flight is the only one. If pairing occurs only during flight, this would explain why adults bred from the egg could with difficulty be induced to suck blood and never oviposited. The author considers it probable that *Trypanosoma* (*Schizotrypanum*) *cruzi*, which was found in 29–35 per cent. of the bugs, is transmitted from one individual to another by coprophagy. The bugs were not observed to feed on excreta, but other Triatomids are known to do so. Moreover, a Schizogregarine parasite (which it is proposed to describe elsewhere but is here named *Machadoella triatomae*) is apparently transmitted in a similar manner. It was found in 39 per

cent. of the bugs in one locality, infesting the Malpighian tubes, and its spores occurred in their excreta. The tick, *Ornithodorus talaje*, Guér., which was common in the huts, was not found to harbour *T. cruzi* after being fed on infected guineapigs [*cf. R.A.E.*, B **22** 145].

Three dogs were found naturally infected with *T. cruzi* and dogs were probably the most important vertebrate host. None of the armadillos or bats examined was infected, and flagellates in monkeys belonged to another species.

In experiments in Hamburg, dogs and various rodents were infected with Guatemalan strains of *T. cruzi*. They proved moderately pathogenic to the mice but did not affect the other animals. A Brazilian strain proved more pathogenic to mice and young dogs, but its virulence was reduced (for mice) and lost (for dogs) after passage through *T. infestans*, Klug. In the locality where the author had his headquarters, 3 per cent. of the children were infected, but all symptoms of chronic Chagas' disease were absent in the population.

KUNERT (H.) & KRAUSE (M.). **Nachtrag zur Arbeit : Findet in *Glossina morsitans* eine zyklische Entwicklung von *Trypanosoma evansi* statt ?** [Supplement to the Paper : Does a Cyclical Development of *T. evansi* occur in *G. morsitans* ?]—*Arch. Schiffs- u. Tropenhyg.* **38** no. 12 p. 534. Leipzig, December 1934.

In answer to enquiries, it is stated that the strain of *Trypanosoma evansi* that was transmitted mechanically but not cyclically by *Glossina morsitans*, Westw. [*R.A.E.*, B **22** 150], had been maintained for 8 months in mice and guineapigs after isolation from camels from Russia. The senior author and C. Schilling were able in 1933 to obtain cyclical transmission by *Glossina* of a strain of *T. congolense* that had been maintained for over 2 years in mice.

NICOLLE (C.) & GIROUD (P.). **Non-transmission au rat, par ingestion, du virus typhique historique contenu dans des poux infectés.**—*C. R. Acad. Sci. Fr.* **199** no. 22 pp. 1169–1170. Paris, 1934.

In two experiments, rats fed on lice [*Pediculus humanus*, L.] infected with the virus of epidemic typhus did not contract typhus. This affords further support to the view that epidemic and murine typhus are not manifestations of the same disease [*cf. R.A.E.*, B **21** 141], since if they were, ingestion of infected lice [*cf.* **21** 217] would be the most probable method by which the virus would be returned from man to rats.

LEGENDRE (J.). **Le moustique maritime.**—*C. R. Acad. Sci. Fr.* **199** no. 22 pp. 1243–1245. Paris, 1934.

Aëdes caspius, Pall. (*punctatus*, Mg.), oviposits in the coastal marshes and canals of Charente-Inférieure where the water is strongly saline. In 1934, eggs were first observed at the beginning of April, and adults in May. The adults were very scarce during the summer, but at the beginning of September they swarmed for a few days in parks and gardens and sometimes bit man. They then disappeared until the end of the month, when further emergence occurred over a period of 6 weeks. Of 12 larvae placed in fresh water 9 died in 2 days and the remainder in 7. The adults seldom enter dwellings and of several hundreds examined none contained blood or eggs. Females

fed in captivity on human blood very rarely oviposit. The succession and development of the generations of this mosquito depend on whether the tides are high enough to cover sites favourable for oviposition.

PARROT (L.). **Notes sur les phlébotomes. IX. Une variété nouvelle de *Phlebotomus papatasi* (Scop.), du Sahara central.**—*Arch. Inst. Pasteur Algérie* **12** no. 3 pp. 383–385, 3 figs., 1 ref. Algiers. 1934. **X. Sur la spermathèque de *Phlebotomus ariasi* Tonnoir.**—*T.c.* pp. 386–388, 1 fig., 4 refs. **XI. Sur les phlébotomes du groupe *minutus* et sur la classification des phlébotomes en général.**—*T.c.* pp. 389–392, 9 refs. **XII. Les éléments de diagnose spécifique des diptères du genre *Phlebotomus* (Psychodidae).**—*T.c.* pp. 393–398, 8 refs.

In the first paper, the author describes *Phlebotomus papatasii* var. *bergeroti*, n., from the Algerian Sahara, and in the second re-describes the duct of the spermatheca of *P. ariasi*, Tonnoir [*cf. R.A.E.*, B **21** 169].

In the third paper, he modifies his previous views on the classification of the genus *Phlebotomus* [**10** 50] and considers that it should be divided into two groups, the species of the subgenus *Prophlebotomus* (of which *P. minutus*, Rond., is the type) being distinguished from those of the typical subgenus by having buccal armature, an alar index generally less than unity, and the hairs on the abdominal tergites all or almost all recumbent [*cf.* **17** 30]. With the exception of *P. schwetzi*, Adl., Thdr. & Parrot, and *P. babu*, Ann., which are known to feed on man [*cf.* **19** 82; **18** 268, etc.], all the species of this group feed on cold-blooded animals.

In the fourth paper, he discusses the characters used to identify the different species of *Phlebotomus* and gives lists of those, particularly comparative measurements, that he considers necessary in a full description of a species.

CURRAN (C. H.). **The Families and Genera of North American Diptera.**—Med. 8vo, 512 pp., portr., 1 col. pl., text ill. New York, J. D. Sherman, 1934. Price $7·50.

The object of this important work is not so much classification of Diptera as their generic identification, and the main portion (pp. 21–480) is therefore occupied with keys to the families and genera of North American Diptera and brief general notes on the morphology, habitat and economic importance of each family. Many new genera are erected. In the introduction, the author briefly discusses the morphology and classification of the Order, its economic importance, and the collection and care of specimens. A glossary of the terms used and an index to the families and genera, showing synonymy, are appended.

MATHIS (M.). **Biologie comparée, en conditions expérimentales, de quatre souches du moustique de la fièvre jaune.**—*C. R. Soc. Biol.* **117** no. 35 pp. 878–880, 6 refs. Paris, 1934.

In order to determine whether examples of *Aëdes aegypti*, L., from widely separated localities belong to different races, the author reared strains from Athens, Cuba, Dakar and Java under identical experimental conditions. He found that their biology was similar and that

all were stenogamic and homodynamic. He concludes that the European, African, American and Oceanian strains are identical [*cf. R.A.E.*, B **16** 48], that the freedom of Asia from yellow fever cannot therefore be explained on biological differences in the vector [*cf.* **18** 197], and that precautions should be taken to prevent the transport by aeroplane of infected mosquitos or of persons in the incubation stage of the disease.

Le Chuiton (F.) & Bourgain (M.). **Tentative de mutation d'un virus du typhus murin en virus boutonneux, par passage dans l'organisme de** *Rhipicephalus sanguineus*.—*Bull. Soc. Path. exot.* **27** no. 9 pp. 825–830. Paris, 1934.

The experiments described were undertaken to test the hypothesis that Marseilles fever is derived from murine typhus by passage through *Rhipicephalus sanguineus*, Latr., and were based on the knowledge that Marseilles fever is transmissible hereditarily. Larvae and nymphs of *R. sanguineus* that were the offspring of females fed on guineapigs infected with murine typhus were injected into or allowed to bite healthy guineapigs, but no infections resulted. Moreover the guinea-pigs were not immune when inoculated with a strain of murine typhus, showing that the ticks had not transmitted the virus without mutation and in an inapparent form.

Brumpt (E.). **Au sujet des changements de propriétés biologiques des germes chez divers hôtes vecteurs vicariants.**—*Bull. Soc. Path. exot.* **27** no. 9 pp. 830–831. Paris, 1934.

With reference to the preceding paper, the author points out that there are no observations or experiments to support the view that passage through different intermediate hosts modifies the biological properties of an organism, Moreover, it would appear that characteristics of an organism, particularly its virulence, that have been modified by mechanical transmission from vertebrate to vertebrate may be restored by passage through its intermediate host.

Parrot (L.). **L'évolution de** *Leishmania tarentolae* **Wenyon chez** *Phlebotomus minutus* **Rond.**—*Bull. Soc. Path. exot.* **27** no. 9 pp. 839–843, 10 refs. Paris, 1934.

Parrot (L.). **Evolution d'un hématozoaire du gecko** (*Leishmania tarentolae*) **chez un moucheron piqueur, du groupe des phlébotomes** (*Phlebotomus minutus*).—*C. R. Acad. Sci. Fr.* **199** no. 20 pp. 1073–1074. Paris, 1934.

In the parts of Algeria and Tunisia near the Sahara, and particularly at Biskra, the gecko (*Tarentola mauritanica* and its varieties) is often parasitised by *Leishmania tarentolae*, which is only known in the leptomonas form that occurs in cultures of the heart blood of the lizard in NNN medium [*cf. R.A.E.*, B **6** 203]. Attempts to discover (by direct microscopic examination) the leishmania form in the blood or viscera of infected geckos have failed ; and it is concluded that the parasite is rare in the organism of the animal, and the infection inapparent. As certain species of *Phlebotomus* (*P. minutus*, Rond., *P. fallax*, Parr., and *P. parroti*, Adl. & Thdr.) from the same regions feed for preference on geckos, it was suspected that they might be the vectors. The geographical distribution of *P. minutus* corresponds with

that of *L. tarentolae* ; neither occurs in Sicily [*cf.* **19** 218] or in northern Algeria, where only *P. parroti* is found. Investigations were therefore undertaken with *P. minutus* in the hope of determining whether transmission is effected by its bites or by its being swallowed by the geckos. Previous attemps to demonstrate intestinal flagellates in *P. minutus* and *P. parroti* (previously confused under the name *P. minutus* var. *africanus*, Newst.) had given negative results [**10** 102] ; but in September 1934, 7 out of 38 examples of *P. minutus* allowed to feed on a gecko proved by blood culture to be infected with *L. tarentolae* were found to contain leptomonas forms of the parasite. Dissections were carried out at varying intervals after the infecting feed. After 3–36 hours some parasites were in the form of " barley grains " with flagella, indicating that they exist in the peripheral blood of the gecko in the leismania rather than the leptomonas form. All the parasites were uniformly distributed throughout the stomach with the ingested blood. After 36–72 hours the flagellates were larger, very numerous and very active, but were still distributed throughout the stomach cavity and showed no tendency to congregate near the cardia or the pylorus. After 72–96 hours one fly contained numerous flagellates, of the same size as the preceding ones, in the stomach and the middle part of the hind gut, but they were for the most part immobile ; the stomach of the other fly was empty, but in the posterior part of the intestine were faecal remains containing immobile parasites. The absence of flagellates in sandflies in which the blood had been digested suggests that, having multiplied abundantly in the stomach, they are expelled, dead, with the faeces. This was confirmed by the finding of dead flagellates in faecal material deposited by the sandflies. No parasites were found in 15 examples of *P. minutus* dissected 6–72 hours after feeding on two healthy geckos. Thus if *P. minutus* is the vector of *L. tarentolae* transmission probably occurs by the ingestion of the sandfly by the gecko.

ROUBAUD (E.). **Observations sur la fécondité des Anophélines.**—*Bull. Soc. Path. exot.* **27** no. 9 pp. 853–854. Paris, 1934.

As there appears to be little information regarding the exact number of eggs that mosquitos, particularly Anophelines, are capable of laying, observations were made on a female of *Anopheles maculipennis* var. *fallax*, Roub. [*R.A.E.*, B **23** 33] taken in Normandy after hibernation and fed regularly on man. It laid 1,145 eggs in six batches between 14th April and 20th May and died on 22nd May.

GALLIARD (H.) & SAUTET (J.). *Anopheles sacharovi* **Favr** (*elutus* **Edw.**) **et** *A. maculipennis* **var.** *labranchiae* **dans leurs rapports avec le paludisme en Corse.**—*Bull. Soc. Path. exot.* **27** no. 9 pp. 855–857, 5 refs. Paris, 1934.

Further investigations on the Anophelines of Corsica [*cf. R.A.E.*, A **22** 64] based on a study of the eggs showed that *Anopheles sacharovi*, Favr (*elutus*, Edw.) occurs in large numbers in all coastal localities surveyed and even in some situated a few miles from the sea. *A. maculipennis* var. *labranchiae*, Flni., is, however, predominant, since it is as prevalent as *A. sacharovi* along the coast and is present alone in all the river breeding-places, even those quite high up the valleys. *A. maculipennis* var. *messeae*, Flni., and var. *melanoon*, Hackett [**22** 200] constituted only about 5 per cent. of the Anophelines.

Although malaria exists wherever the Anophelines occur, its intensity varies considerably even in adjacent localities. No explanation for this could be found, since the species of Anophelines were the same and had similar maxillary indices, their density was sufficient for transmission even in localities where the malaria incidence was low, animals were stabled in the same manner everywhere (in one malarious locality where the stables presented apparently ideal shelters, the Anophelines were found in bedrooms), and although the indigenous population was immune, imported labour and soldiers became infected in some localities and remained free from infection in others.

TREILLARD (M.). **L'insectarium expérimental de l'Institut Pasteur de Saïgon : conception et fonctionnement.**—*Bull. Soc. Path. exot.* **27** no. 9 pp. 863–865, 2 pls., 1 plan. Paris, 1934.

An illustrated description (together with a plan) is given of the insectarium of the Pasteur Institute of Saigon, which was completed in 1932.

KEMPER (H.). **Die Taubenzecke,** *Argas reflexus*, **als Plageerreger in menschlichen Wohnungen.** [The Pigeon Tick, *A. reflexus*, as a Pest in Houses.]—*Anz. Schädlingsk.* **10** no. 12 pp. 139–140, 1 fig. Berlin, 15th December 1934.

Between May to July 1934 four cases were reported in Germany of adults of *Argas reflexus*, F., occurring in houses and attacking the residents. It is suggested that the hot summer may have led to an unusual increase of this tick.

[GUTZEVICH (A. V.).] **Гуцевич (А. В.). Ueber die graphische Darstellung einiger Angaben über die Biologie der Mücken.** [On the graphic Representation of certain Data in the Biology of Mosquitos.] [*In Russian.*]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 5–16, 6 graphs, 18 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

The seasonal occurrence of *Anopheles maculipennis*, Mg., in European Russia and on the Black Sea Coast of Transcaucasia is represented by means of graphs, this method being considered clearer than that of comparative tables adopted in a previous calendar [*R.A.E.*, A **23** 7]. Data from districts with different climatic conditions show that on an average oviposition starts within 13 days after the adults begin to leave their hibernation quarters, the first larvae appear about a week later, the larval stage lasts about 3 weeks and the pupal stage about 4 days. The number of generations a year varies with the locality. A separate graph illustrates the spring development in central Ukraine of *A. maculipennis*, *A. claviger*, Mg. (*bifurcatus*, auct.), and *Aëdes dorsalis*, Mg., which hibernate in the adult, larval and egg stages respectively. The eggs of *Aëdes* hatch as soon as the water is free from ice ; the hibernating larvae of *Anopheles claviger* become active when the temperature rises to 8–9°C. [46·4–48·2°F.], and larvae of *A. maculipennis* hatch when the adults of *A. claviger* are about to emerge. One graph shows the development of *Aëdes aegypti*, L., under laboratory conditions.

[KAZANTZEV (B. N.).] **Казанцев (Б. Н.). Mückenfauna des Schachrud'schen Wasserbeckens.** [The Mosquito Fauna of the Shakhrud Basin.] [*In Russian.*]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 17–32, 1 map, 11 figs., 3 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

A detailed account is given of investigations in 1927–31 on mosquitos in the district of Bokhara (Uzbekistan), where large swamps are formed following frequent damage by water to the raised edges of irrigation ditches. The swamp water, which was usually shallow, was the chief breeding-place of *Anopheles hyrcanus*, Pall., *A. sacharovi*, Favr (*maculipennis* var. *elutus*, Edw.) and *A. pulcherrimus*, Theo. The larvae of the first two appeared early in May and became particularly abundant in June ; they were most numerous in water in which reeds and rushes were growing. The larvae of *A. pulcherrimus* hatched in late May or early June, reached their maximum abundance in August, and preferred clear water with a thick submerged carpet of pondweed (*Potamogeton*). No mosquito larvae occurred in the presence of *Chara*. Other mosquitos breeding in the swamps were *Culex pipiens*, L., and *Uranotaenia unguiculata*, Edw., which were scarce, and *C. modestus*, Fic., which was abundant, the larvae thriving in places containing pondweed and the adults causing great annoyance from the end of May. The author states that adults of *A. hyrcanus* taken in Uzbekistan and Tadzhikistan in the summer are always dark coloured, whereas the hibernating females taken in November or March are light coloured and could be identified as var. *mesopotamiae*, Chr. & K. C. ; he believes, therefore, that in Central Asia the pale colour represents a biological phase.

Artificial ponds periodically filled with water were often infested with the larvae of *Aëdes caspius*, Pall. (small dark form), which was the most widely distributed mosquito in the district. The eggs are probably laid on the water before the pond is drained, but are not able to hatch unless they have passed through a period of desiccation ; in the laboratory, the females only oviposited on water, ignoring dishes that contained dry or damp earth. The Anophelines only occurred in ponds with dense submerged vegetation, *A. sacharovi* being especially abundant in shallow ponds that were seldom full. *Aëdes vexans*, Mg., was scarce, but occurred considerably more frequently, together with *A. caspius*, in casual collections of water formed by the overflowing of irrigation ditches. The larvae of *C. pipiens* and *Theobaldia longiareolata*, Macq., throve in ponds with polluted water.

Fresh surface water in disused clay pits harboured larvae of *Anopheles*, especially in the presence of *Ranunculus*, *A. sacharovi* being predominant. This species, together with *A. pulcherrimus*, was also abundant in pits and ditches containing slightly brackish water, other mosquitos breeding there being *Aëdes caspius*, *C. pipiens*, *C. modestus* and single larvae of *Anopheles superpictus*, Grassi. No adults of *A. superpictus* have, however, been observed in the Bokhara district during investigations from 1924 to 1931. In spring, pits containing markedly saline ground water harboured larvae of *Aëdes detritus*, Hal., and of the large sandy-coloured form of *A. caspius* ; the water dries up in May but reappears in the pits in the following spring, when the larvae hatch from overwintered eggs. No mosquito larvae were found in deep wells, but shallow wells used for cattle, and shafts for measuring the

level of the water table harboured small numbers of Anophelines. In these shafts larvae of the third and fourth instars and pupae of *T. subochrea*, Edw., and *T. longiareolata* occurred in December and January; adults were obtained from them in the laboratory, and females were taken in the field in January and February, so that it is probable that development is completed during periods of warm weather in winter. In summer, larvae of *T. subochrea* were much more scarce than those of *T. longiareolata*, probably because exposed water was too warm for them; they chiefly occurred in deep shafts or shaded ditches. *Aëdes pulchritarsis* var. *asiaticus*, Edw. (*stegomyina*, Stack & Montch), which breeds exclusively in holes at the base of tree trunks, was very rare.

[GUTZEVICH (A. V.) & GUROV (G. M.).] **Гуцевич (А. В.) и Гуров (Г. М.). Zur Fauna und Biologie der Mücken in Azerbaidschan.** [Contribution to the Question of the Species and Biology of Mosquitos in Azerbaijan. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 33–40, 7 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

This paper deals with observations in July 1931 on mosquitos in various parts of Azerbaijan, where malaria is more severe than in any other part of the Russian Union. A list is given of the 18 mosquitos previously recorded from the country, which include *Anopheles sacharovi*, Favr (*maculipennis* var. *elutus*, Edw.) in addition to the Anophelines already noticed [*R.A.E.*, B **20** 58]. Four more species were found by the author, *viz.*: *Mansonia* (*Taeniorhynchus*) *richardii*, Fic., in an arid zone in the south-east, *Culex modestus*, Fic., which was widely distributed, *Aëdes pulchritarsis*, Rond., and *A. geniculatus*, Ol. The distribution of the mosquitos, the habitats of the adults and larvae, and the number of individuals taken are shown in tables. The Anophelines, of which *A. maculipennis*, Mg., was the most abundant and widely distributed, occurred almost exclusively in buildings, both inhabited and uninhabited, and only in negligible numbers in the open. *Aëdes caspius*, Pall., was also numerous in buildings, and in the south-eastern part of the country was the predominant species in outhouses and animal quarters.

In the south-eastern arid zone, larvae of *A. maculipennis* were abundant in pools fed by springs in an otherwise dry river bed, and numerous adults occurred in all the neighbouring villages. Pits and other temporary accumulations of water also served as breeding-places for this mosquito and for *C. pipiens*, L., *C. modestus* and *Aëdes caspius*. No adult mosquitos were found by day in the steppe-land between the villages, but a few were taken at night in the vicinity of houses, where there was shelter from the heat.

Larvae of *C. theileri*, Theo., were found in a polluted brook. A small pool of clear spring water void of vegetation harboured larvae of *Anopheles maculipennis* and a few of *Culex mimeticus*, Noé, which is rare in Transcaucasia. Larvae of *A. hyrcanus*, Pall., occurred in flooded meadows on the River Arax in small permanent pools with banks overgrown with reeds. These pools are very suitable for *Gambusia*, the introduction of which into Azerbaijan is highly desirable.

[LISOVA (A. I.).] **Лисова (А. И.). Ueber die experimentelle Infektion von *Anopheles* durch Malaria Plasmodien.** [Experimental Infection of *Anopheles* with Malaria Parasites in the Village of Toĭ-Tyube. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 41–48, 3 figs., 6 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

Details are given of investigations carried out in 1931 in a village near Tashkent where malaria is hyperendemic to ascertain whether *Anopheles algeriensis*, Theo., and *A. hyrcanus* var. *pseudopictus*, Grassi, are of importance as vectors. Larvae of *A. algeriensis* were found in saline water in an irrigation ditch leading from a lake and in fresh water in another lake; both lakes were fed by springs. The larvae were almost always associated with those of *Culex apicalis*, Adams, and occurred in clear cold water 1½–3 ft. deep and heavily shaded by reeds and other plants. In the ditch, they kept close to the banks, where the current was slow. At the end of September practically all the mature larvae and pupae had disappeared. No adults were found, though a few had been taken in August of the preceding year. *A. superpictus*, Grassi, *A. claviger*, Mg. (*bifurcatus*, auct.), and *A. sacharovi*, Favr, also occurred in the fresh-water lake. Larvae of *A. hyrcanus* var. *pseudopictus* were found in the saline water in places not too densely overgrown with vegetation, and the adults were abundant in the field.

In infection experiments, mosquitos bred in the laboratory were dissected 3–5 days after feeding on persons infected with benign tertian (*Plasmodium vivax*) or malignant tertian [*P. falciparum*]. *A. sacharovi* was used for comparison with 39 females of *A. hyrcanus* var. *pseudopictus* and 34 of *A. algeriensis*. Of *A. sacharovi*, 62·5 per cent. were infected with *P. vivax* and 45·5 with *P. falciparum*. No infection with *P. falciparum* was obtained in the other two species, but 17·6 per cent. of *A. hyrcanus* var. *pseudopictus* and 4·5 (1 individual out of 34) of *A. algeriensis* were infected with *P. vivax*.

[LISOVA (A. I.) & ÉSKIN (V. A.).] **Лисова (А. И.) и Эскин (В. А.). Infektion von *Anopheles maculipennis* var. *sacharovi* F. durch Malariaplasmodien in natürlichen Bedingungen in einem Reisfeldbezirk Uzbekistans.** [The Infection with Malaria Parasites of *A. sacharovi*, Favr, under natural Conditions in a Rice-cultivating Region in Uzbekistan. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 49–62, 4 figs., 1 graph, 9 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

This is an account of work carried out during a severe epidemic of malaria in July–November 1930 in a village of the Tashkent district [see preceding paper]. Favourable breeding conditions for mosquitos are afforded by neglected rice-fields and by a defective irrigation system, vast expanses of water being formed, much of which is covered with dense vegetation. Females of the following species of *Anopheles* were found: *A. pulcherrimus*, Theo., *A. superpictus*, Grassi, and *A. claviger*, Mg. (*bifurcatus*, auct.), all of which were rare; *A. hyrcanus* var. *pseudopictus*, Grassi, which hardly never occurred in inhabited houses, but attacked man in the open after sunset and also in rooms if the windows and doors were open; *A. algeriensis*, Theo., of which only four individuals were taken; and *A. sacharovi*, Favr, which was very abundant in inhabited houses except when they were close to animal

quarters, when it was only numerous in the latter. Adults of *A. sacharovi* taken in dwellings were dissected after 4–6 days till the end of August, and after 8–10 days from September till November. Of 556 examined, 36 contained oöcysts or sporozoites, or both. The last infected mosquito was taken on the 18th September. The sporozoites usually occurred in the thorax and abdomen as well as in the salivary glands. The rate of infection was highest in August.

In one instance no malaria parasites could be observed in the blood of patients suffering from primary malaria, whereas they were found in mosquitos taken in the same room. This suggests that the occurrence of the parasites in mosquitos might serve as supplementary data in diagnosis.

Some of the mosquitos, particularly those taken in mosquito-nets in September, were infested with Nematodes, which were usually present in the Malpighian tubes and sometimes completely blocked them.

[Khodukin (N. I.) & Sofiev (M. S.).] **Ходукин (Н. И.) и Софиев (М. С.). Vergleichende Morphologie von** *Leishmania canis* **in den Kulturen und im Darm des Ueberträgers der Stechmücke** *Phlebotomus*. [Comparative Morphology of *L. canis* in Cultures and in the digestive Tract of the Vector—the Sandfly (*Phlebotomus*). (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 63–72, 2 figs., 1 graph. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

In continuation of previous work [*R.A.E.*, B **19** 193, etc.] on the development in sandflies of *Leishmania canis*, which the author considers identical with *L. donovani* (*infantum*) causing visceral leishmaniasis in man in Central Asia [**19** 55], experiments were carried out in Tashkent to ascertain whether its development in NNN medium is different. Females of *Phlebotomus* were fed on diseased dogs by a method already noticed [**17** 252], and cultures of *Leishmania* in a typical NNN medium were obtained by placing a particle of the marrow or spleen of a diseased dog on agar. Of a total of 300 sandflies, 4 per cent. were infected. The development of *L. canis* in them and in culture is described in detail. At 26°C. [78·8°F.] the development of the flagellate forms in the sandflies was completed in 24–48 hours, whereas in the artificial medium it took place only on the fourth day and degenerate forms became numerous only on the fifth day. In the culture, the stout forms predominated throughout the period of observation, whereas in the sandflies the elongated ones became more numerous on the fifth day. Another important difference consisted in the presence of herpetomonas forms in the sandflies, whereas they never occurred in the artificial medium. On the basis of the forms observed, the authors discuss the systematic position of *Leishmania*.

[Isaev (L. M.).] **Исаев (Л. М.). Beiträge zur Morphologie der Gattung** *Phlebotomus* **(I–II).** [Data on the Morphology of the Genus *Phlebotomus* (I–II).] [*In Russian.*]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 73–87, 16 figs., 5 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

As a preliminary to a series of papers on the characters of species of *Phlebotomus*, the author gives a detailed account, revising and supplementing data obtained by previous workers, of the structure of the last abdominal segment of the males and of the female hypopygium.

[VLASOV (Ya. P.).] **Власов (Я. П.). Ueber das Vorfinden von** *Phlebotomus* **in der Umgegend von Aschchabad in den Höhlen der Nagertiere** (*Rhombomys opimus* **Licht. und** *Spermophilopsis leptodactylus* **Licht.).** [On the Finding of Sandflies in the Environs of Ashkhabad in the Burrows of Rodents (*R. opimus* and *S. leptodactylus*). (*In Russian*).]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 89–102, 3 figs., 1 fldg graph, 4 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

An account is given of investigations in January–October 1931 in a sandy plain near the town of Ashkhabad in south-western Turkmenistan on the Arthropods occurring in burrows of *Rhombomys opimus* and *Spermophilopsis leptodactylus*, both of which are very common in the district. The local climate and the microclimate of the burrows, which are 1½–8 ft. deep, are discussed; the burrows are relatively cool and moist, and are little affected by the daily sharp fluctuations in temperature and humidity that take place above ground.

The Arthropods found in the nests and burrows of *R. opimus* included *Phlebotomus caucasicus*, Marz., *P. chinensis*, Newst., and *P. grekovi*, Khod., the fleas, *Xenopsylla gerbilli*, Wagn., *X. conformis*, Wagn., *Rhadinopsylla cedestis*, Roths., *Synosternus pallidus*, Tasch., *Coptopsylla* sp., *Ceratophyllus* sp., and *Ctenophthalmus* sp., and the ticks, *Hyalomma dromedarii asiaticum*, P. Schultze & Schlottke, *Haemaphysalis* sp., and *Ornithodorus* sp. In Central Asia, the three species of *Phlebotomus* have only hitherto been recorded from much further east [*R.A.E.*, A **19** 55, 172]. They presumably breed in the burrows, as the heat and dryness of the air and soil outside would prevent their development. In view of the fact that *R. opimus* is subject to plague and has been found associated with the disease in man, the presence of fleas in its burrows is of special importance.

The Arthropods found in the nests and burrows of *S. leptodactylus* included *P. grekovi* and *P. minutus*, Rond.: the ticks, *Ornithodorus* sp., which was rare, and *H. dromedarii asiaticum*; and the fleas, *Rostropsylla dacus*, J. & R., which was common, and *Stenoponia conspecta*, Wagn., and *Coptopsylla bairamaliensis*, Wagn., which were rare. It is pointed out that in this desert area the nomadic tribes move their encampments several times a year, so that the burrows of rodents are the only places with a microclimate suitable for the development of various ticks.

[PAVLOVSKIĬ (E. N.) & GLEZER (B. M.).] **Павловский (Е. Н.) и Глезер (Б. М.). Larve von** *Hypoderma lineatum*, **als Parasit des Menschenaugen.** [The Larva of the Warble-fly (*H. lineatum*) as a Parasite of the Eye (Eyelid) of Man. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 103–114, 1 fig., 24 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

A case is described of infestation of the eyelid of a child by a larva of *Hypoderma lineatum*, Vill. It was observed in November 1930 in southern Ukraine and is the first recorded from the Russian Union. The larva, which is described, became visible and was removed 40 days after the infestation took place, and was in the stage in which under normal conditions the larvae make their way to the backs of cattle. The various types of infestation of man by *Hypoderma* are briefly reviewed. This can only take place during the period of oviposition,

at the end of the summer or in the autumn, and as the larvae tend to migrate upwards, in man they make their way to the head.

[Nakhlupin (N. G.) & Pavlovskiĭ (E. N.).] **Нахлупин (Н. Г.) и Павловский (Е. Н.). Zur Biologie der Hautbremse des Renntiers**—*Oedemagena tarandi*—**in der Tundra Bolschesemelsk.** [Contribution to the Biology of the Bot-fly of Reindeer, *O. tarandi*, in the Bol'shezemel'sk Tundra. (*In Russian*.)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 115–129, 4 figs., 8 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

The results are given of three years' observations (1929–31) on the bionomics of *Oedemagena tarandi*, L., which is a serious pest of reindeer in the tundra on the river Pechora in north-east European Russia. The eggs and larvae are described. The life-cycle is complete in a year, of which 10 months are spent as a larva in the body of the reindeer. The adults, which are active for about a month, are specially abundant at the end of July and in August. In the laboratory they may emerge in May, but they seldom live in captivity for more than 3–11 days. In the field, they rest for most of the day in places sheltered from wind and sun, and approach the reindeer only for oviposition. They are only numerous in places where pupation has occurred, and are rare at a distance of 37–62 miles from the spring pastures of the reindeer. White reindeer and those that lie on the ground from exhaustion are most severely infested. The flies usually hover near the herd on hot days when there is a slight wind from the place where the larvae had dropped to the ground; they often alight on the soil and from there climb on to the animals. As a rule, more flies occur on southern slopes. Most of the eggs are laid on the hair where it is long, and very few on the head or the lower part of the legs [*cf. R.A.E.*, B **6** 78; **14** 214]; usually 2–3 are laid on one hair and those that are nearer to the body of the host hatch sooner. Eggs are also readily laid on hides of freshly killed reindeer. One female oviposits on several animals; the maximum number of eggs found in a female captured near the herd was 529. Fewer eggs hatch if the weather is hot and dry. If the bulk of oviposition occurs in mid-August, the larvae are present in numbers in the connective tissues and muscles of the reindeer calves in mid-September, and in adult animals in October. Warbles in the hides begin to appear a month later, and from the end of April are very conspicuous. Examination of a herd of reindeer from May to July 1930 showed an average of 187 larvae per head. Most of them occurred in a strip 10 ins. wide on either side of the spine. They drop to the ground between the end of May and July and pupate in the grass. The pupae require a fair amount of warmth and very little humidity. Mature larvae kept in thawing snow for 12–48 hours or in water for 2–3 days did not produce adults, and the number of flies is greatly reduced in years when frost occurs after the larvae have dropped to the ground.

The measures practised locally include driving the reindeer as far as possible from the pastures where the larvae have pupated, and spreading hides of white reindeer on the ground near the herd and killing the flies as they alight on them. Squeezing out the maggots is only possible if the animals are more or less tame. If too many larvae are squeezed out at a time, the reindeer become ill and often die. In experiments, however, they were not affected by injection of the body juices of the larvae.

[PAVLOVSKIĬ (E. N.), STEĬN (A. K.) & BUICHKOV (V. A.).] **Павловский (Е. Н.), Штейн (А. К.) и Бычков (В. А.). Experimentelle Untersuchungen über die Wirkung einiger Verdauungssekrete von** *Musca domestica* **auf die Hautdecken des Menschen.** [Experimental Investigation on the Effect of certain digestive Secretions of the House-fly (*M. domestica*) on the dermal Tissues of Man. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 131–147, 7 figs., 5 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

A detailed account is given of the technique and results of experiments on the effect on the skin of man of the saliva and extracts from the crop of *Musca domestica*, L. It was found that the saliva contains active elements that have an irritating effect on the skin tissues of man and may cause inflammation ; these elements are thermolabile. The reaction only occurs, however, if the surface of the skin has been injured so that the saliva is able to penetrate into it. If the fly deposited saliva in fresh wounds, it might increase the inflammatory process. The effect of extracts prepared from dried salivary glands is only slightly weaker than that of emulsions made of fresh glands.

The crop of *M. domestica* did not apparently contain elements that produce irritation of the skin.

[BUICHKOV (V. A.).] **Бычков (В. А.). Ueber die Aufbewahrungsdauer von** *Bacterium prodigiosum* **durch die Fliegen.** [The Duration of the Persistance of *B. prodigiosum* in Flies. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 149–159, 2 figs., 5 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

A detailed account is given of investigations on the time for which house-flies (*Musca domestica*, L.) can harbour *Bacillus prodigiosus*. Though this organism is not pathogenic, data on it may be of value in research on the relation of flies to pathogenic micro-organisms. The results obtained confirmed those of Graham-Smith [*R.A.E.*, B **2** 19], in that bacteria were still present in the flies on the 17th day after they had been infected. The numbers of bacteria found on and in the flies (which are shown in a table) were, however, far larger than those observed by Graham-Smith. When feeding on infectious matter, flies were able to ingest as many as 660 million bacteria. The bacteria presumably propagate intensively in the digestive tract of the fly, as otherwise they would be eliminated with its faeces in 1–2 days. Flies placed in dishes containing agar readily disseminated the bacteria present on and in them. It is important, however, to ascertain the period of survival of bacteria in flies under natural conditions, as exposure of the flies to the sun is liable sharply to reduce the numbers of bacteria that do not bear spores [**23** 14, etc.].

[PETRISHCHEVA (P. A.).] **Петрищева (П. А.). Zur Biologie der Hausfliege in den Bedingungen der Stadt Samara.** [The Biology of the House-fly under the Conditions of the Town of Samara. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 161–182, 3 graphs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

An account is given of investigations in 1929 on *Musca domestica*, L., in and near the town of Samara on the Volga. Insectary data

indicated that 6 generations may be produced in a year under natural conditions, the life-cycle averaging 4 weeks. In a thermostat, development was completed in 6–8 days at 35°C. [95°F.] and sometimes in 5 days at 38–40°C. [100·4–104°F.]. The earliest pairing was observed within 18–35 hours of emergence, but it usually occurred on the 6th or 7th day, oviposition starting 4–6 days later. In the town the larvae occurred chiefly in latrines, cesspools and dustbins, and the adults in restaurants, tea-rooms, public kitchens and inhabited houses. The flies preferred well-lit places that were exposed to the sun for part of the day, and refuse heaps, etc., in the shade were considerably less infested.

In winter, adult flies were present chiefly in inhabited houses, though in small numbers only [*cf. R.A.E.*, B **18** 116]; all those taken were females, which tends to indicate that the males do not hibernate. They were already fertilised, and when placed in a thermostat at 30–32°C. [86–89·6°F.], 98 per cent. oviposited, those that were taken in warm places usually doing so within 40 minutes [*cf.* **19** 259]. As a rule, only some of the eggs hatched. Flies reared in winter cages were very active and paired 3–4 days after emergence at 14–17°C. [57·2–62·6°F.]. It is probable that the immature stages also survive in winter, as larvae were found in late February and early March in horse manure under the wooden floor of a heated stable. When placed in a thermostat, these larvae pupated in 26½ hours, and the adults emerged on the third day. Moreover, newly emerged adults of *Muscina stabulans*, Fall., were taken outdoors as early as 7th May. In experiments, mature larvae of *M. domestica* were able to resist a temperature of −10°C. [14°F.] for 4 hours. Young larvae did not lose their vitality when subjected to low temperature, with a minimum of −2°C. [28·4°F.], for 3½ hours, but died at lower temperatures. Mature larvae in horse manure were unaffected by a fortnight's exposure to a temperature of from −1 to −2°C. [30·2–28·4°F.], but these and larvae at 1–10°C. [33·8–50°F.] did not pupate until transferred to a higher temperature. The resistance of the larvae to low temperature is another indication of their ability to hibernate.

In September most of the flies in houses were infested with *Empusa muscae*, the mortality in some instances being 100 per cent. Infection of *Musca domestica* and *Muscina stabulans* with this fungus in the laboratory, by dusting them with powder made of dried flies that had been killed by it in the preceding year, gave a mortality of 98–100 per cent. throughout June, July and the first half of August, during which months the flies in nature were free from infection. The incubation period lasted 4–15 days, whereas in September it only required 3–4 days. Attempts to infect the flies *per os* were unsuccessful. Infection of 4 examples out of 20 of *Calliphora erythrocephala*, Mg., was also obtained, the incubation period (in June) lasting 7–10 days.

In the laboratory, larvae of all three flies were found to harbour *Herpetomonas muscae-domesticae* (*muscarum*); the infection probably occurred through the substratum being infected by the excreta of the adult flies. Infection of the adult flies (of all three species) in the field was most common in midsummer; the flagellate did not injure them and is thought to be a symbiont.

[Matikashvili (N. V.).] **Матикашвили (Н. В.). Beiträge zur Fauna und zur geographischen Verbreitung der Ixodoideen in der sozialistischen Sowjetrepublik Grusiens.** [Contribution to the Fauna and geographical Distribution of the Ticks Ixodoidea in the SSR of Georgia. (*In Russian.*)]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 223–234, 10 figs., 1 fldg table. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

In view of the fact that cattle in Georgia suffer severely from piroplasmosis and other protozoan diseases, investigations were carried out in 1930 and 1931 on the presence of ticks in that country. The 14 species found were *Ixodes ricinus*, L., *Haemaphysalis inermis*, Bir., *H. cinnabarina punctata*, C. & F., *H. cholodkovskii*, Olen., *H. sulcata*, C. & F., *Dermacentor niveus*, Neum., *D. silvarum*, Olen., *Rhipicephalus sanguineus*, Latr., *Hyalomma detritum*, P. Schultze, *H. marginatum*, Koch, *Argas persicus*, Oken, *Ornithodorus lahorensis*, Neum., *Rhipicephalus bursa*, C. & F., *R. sanguineus*, Latr., and *Boophilus annulatus calcaratus*, Bir. Notes are given on their local distribution, dates of capture and hosts. Evidence was obtained that certain ticks occur in pastures at altitudes of over 6,500 ft. Notes to facilitate identification are given on the morphology of the nymphs of *B. annulatus calcaratus* and of the genera *Hyalomma*, *Rhipicephalus* and *Haemaphysalis*.

Papers noticed by Title only.

Roubaud (E.) & Mezger (J.). **Présence à Madagascar de** *Dinopsyllus lypusus* **J. et R.** [in small numbers on rats and dogs] **puce pestigène des rongeurs de l'Afrique du Sud.**—*Bull. Soc. Path. exot.* **27** no. 8 pp. 740–741. Paris, 1934.

Boyé (R.) & Rivierez (M.). **Un cas de dermatose accidentelle du type sarcoptique, provoquée par un** *Tarsonémus*.—*Bull. Soc. Path. exot.* **27** no. 8 pp. 759–762, 1 fig. Paris, 1934.

Ioff (I.) & Argyropulo (A.). **Die Flöhe Armeniens** [The Fleas of Armenia, including a new genus, 9 new species and 4 new subspecies].—*Z. Parasitenk.* **7** no. 2 pp. 138–166, 21 figs., 6 refs. Berlin, 11th December 1934.

Schulze (P.). **Ueber eine Zeckenausbeute von Kleinsäugern aus Java.** [On Ticks collected on small Mammals from Java.]—*Z. Parasitenk.* **7** no. 2 pp. 167–171, 2 figs. Berlin, 11th December 1934.

Wagner (J.) & Argyropulo (A.). **Aphanipterenfauna des Aserbeidschan (östlicher Teil Transkaukasiens) nebst Bemerkungen über die Gattung** *Nosopsyllus* **Jord.** [Siphonaptera of Azerbaijan (eastern part of Transcaucasia) with Notes on the Genus *Nosopsyllus* (including 4 new species and 1 new subspecies).]—*Z. Parasitenk.* **7** no. 2 pp. 217–232, 11 figs. Berlin, 11th December 1934.

Becker (F. E.) & d'Amour (F. E.). **Anti-serum against Black Widow Spider** [*Lactrodectus mactans*, F.] **Venom.**—*Proc. Soc. exp. Biol. Med.* **32** no. 1 pp. 166–167. New York, October 1934.

[POMERANTZEV (B. I.).] **Померанцев (Б. И.). Beiträge zur Morphologie und Anatomie der Genitalien von** *Culicoides* **(Diptera, Nematocera).** [Contribution to the Morphology and Anatomy of the Genitalia of *Culicoides* (male and female genitalia of *C. nubeculosus*, Mg., and female genitalia of *C. fuscipennis*, Staeg., which attack cattle in the Leningrad Area).] [*In Russian.*]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 183–214, 26 figs., 25 refs. Leningrad, 1932. (With a Summary in German.) [Recd. November 1934.]

[KIRSHENBLAT (Ya. D.).] **Киршенблат (Я. Д.). Uebersicht über die auf dem Territorium der USSR getroffenen Käfer** *Paederus* **Fabr.** [Review of the Beetles of the Genus *Paederus* occurring in U.S.S.R.] [*In Russian* with descriptions of new species also in German.]—*Mag. Paras. Inst. zool. Acad. Sci. URSS* **3** pp. 215–222, 1 fig., 1 ref. Leningrad, 1932. [Recd. November 1934.]

MONIER (H. M.), GUY (R.) & ROS (M.). **Renseignements sur le paludisme recueillis dans les régions de Luang-Prabang et Paklay, au Laos.**—*Ann. Méd. Pharm. colon.* **32** no. 3 pp. 309–327. Paris, 1934. [*cf. R.A.E.*, B **22** 32, 63.]

BRUG (S. L.). **Culicidae, collected from** *Nepenthes* **in Borneo** [including larva of *Armigeres* (?) *brevitibia*, Edw.]—*Natuurh. Maandbl.* **23** no. 11 pp. 149–150, 1 fig., 2 refs. Maastricht, 30th November 1934.

O'KANE (W. C.), WESTGATE (W. A.) & GLOVER (L. C.). **Studies of Contact Insecticides VII. 1. Methods of expressing Toxicity. 2. Toxicity of Nicotine, Heptylic Acid and Caproic Acid to Mosquito Larvae,** *Culex pipiens* **L.** [Comprising studies on mathematical methods of expressing toxicity.]—*Tech. Bull. N.H. agric. Exp. Sta.* no. 58, 35 pp., 24 figs., 17 refs. Durham, N.H., June 1934. [Recd. December 1934.]

MAYER (K.). **Die Nahrung der Ceratopogonidenlarven (Dipt.).** [The Food of Ceratopogonid Larvae.]—*Arch. Hydrobiol.* **27** no. 4 pp. 564–570, 1 fig., 6 refs. Stuttgart, 1934. [*Cf. R.A.E.*, B **22** 217.]

MAYER (K.). *Forcipomyia* (*Lasiohelea*) *chrysopae* **n. sp. und** *Forcipomyia crudelis* **Karsch, zwei Blutsauger an Insekten.** [Two Blood-suckers on Insects in Germany, *F. chrysopae*, sp. n., on wing of *Chrysopa perla*, L., and *F. crudelis*, Karsch, on a sawfly larva.]—*Arb. morph. taxon. Ent. Berl.* **1** no. 4 pp. 259–260, 2 figs. Berlin, 5th December 1934.

RAYNAL (J.) & GASCHEN (H.). **Sur les Phlébotomes d'Indochine. IV. Présence de** *Phlebotomus bailyi* **var.** *campester* **(Sinton 1931) en Annam et description de** *Phlebotomus bailyi* **var.** *campester* ♂.—*Bull. Soc. Path. exot.* **27** no. 9 pp. 858–862, 4 figs., 1 ref. Paris, 1934. [*Cf. R.A.E.*, B **22** 190.]

CURRAN (C. H.). **New Species of Nycteribiidae and Streblidae (Diptera)** [from Panama].—*Amer. Mus. Novit.* no. 765, 15 pp., 12 figs. New York, 10th January 1935.

Paramonow (S. J.). **Dipterenlarven zur biologischen Behandlung von Osteomyelitis und Gasbrand.** [Dipterous Larvae for the biological Treatment of Osteomyelitis and Gas Gangrene.]—*Z. wiss. InsektBiol.* **27** no. 5–6 pp. 82–85. Berlin, November 1934.

In three cases of gas gangrene where amputation appeared inevitable, Dr. M. M. Schkaláberda of Kiev obtained cures by placing 20–30 larvae of *Musca domestica*, L., in the wounds. After 48 hours the limbs were beginning to heal well.

The author points out that in previous cases [*R.A.E.*, B **20** 125–129] Calliphorid larvae were used, but that they are also known to produce myiasis in man and to feed on healthy as well as decayed tissue. In view of this, it is difficult to explain why their surgical use is successful without resulting in infestation of healthy tissue. Muscid larvae are not only smaller than Calliphorid larvae, but are more saprophagous and feed less readily.

The causes of the beneficial action of fly larvae are not properly known, but it is probable that besides the purely mechanical destruction by ingestion of unhealthy tissue, other factors, such as products of metabolism, ferments connected with feeding, biological reaction of the healthy tissues and access of oxygen, may be very important.

Stewart (M. A.). **The Rôle of *Lucilia sericata* Meig. Larvae in Osteomyelitis Wounds.**—*Ann. trop. Med. Parasit.* **28** no. 4 pp. 445–460, 23 refs. Liverpool, December 1934.

The means by which the larvae of *Lucilia sericata*, Mg., promote the healing of lesions due to osteomyelitis is discussed both from the author's own observations and those of other workers.

The following is largely taken from his summary : Blow-fly larvae are reported to be able to digest necrotic tissue by the macerating activities of the mouth-hooks and by predigestion effected by tryptase present in the excreta, which is active in an alkaline reaction [*cf.* *R.A.E.*, B **20** 162, 231]. Such alkalinity is effected by ammonia in the excreta and by calcium carbonate exuded through the body wall. The alkaline reaction not only activates the tryptase, but also reduces the swelling of the soft tissue (thereby increasing the rate of drainage from the infected wound and consequently decreasing bone destruction), and counteracts the acid condition that promotes autolysis of the tissue cells. The exudation of calcium carbonate is also important because calcium ions possess a marked specificity for phagocytosis.

Bacteriological tests for the presence of viable bacteria in the mid- and hind-gut of larvae after they had fed on pure cultures of *Staphylococcus aureus*, the most common organism causing osteomyelitis, gave negative results, but histological examination showed these organisms to be present in large numbers, without any evidence of their having undergone any dissolution, throughout these regions. It is therefore concluded that the bacteria are killed but not by a process of true digestion. Hobson has shown that the middle region of the mid-gut of larvae of *L. sericata* has a reaction of from pH 3·0 to 3·5. Tests reported in this paper show that all *S. aureus* were killed after exposure to a buffer solution with a reaction of pH 3·2 for 4 hours (which is well within the limit of time that food usually remains in this region of the intestine) and almost all were killed after an exposure of

1 hour. No bacteriophage has been found in the maggots. Destructive bacterial exotoxin liberated in the wound is undoubtedly ingested by the larvae and is probably rendered inert by the direct action of the acid present in the mid-gut or by virtue of the possession of an isoelectric point at, or close to, pH 3·2, which would cause it to be thrown down as an inert compound. The marked healthy granulation of wounds treated by means of blow-fly larvae is apparently due either to an alkaline reaction or to calcium ion activity or to both.

Larvae of *L. sericata* produced extensive myiasis in experiments on man and guineapigs but showed a marked preference for necrotic tissue [**22** 130].

EVANS (A. M.). **Further Notes on African Anophelines, with a Description of a New Group of** *Myzomyia*.—*Ann. trop. Med. Parasit.* **28** no. 4 pp. 549–570, 11 figs., 13 refs. Liverpool, December 1934.

Descriptions are given of the female, pupa and larva of *Anopheles distinctus* var. *ugandae*, n., from Uganda, of the adults of both sexes and the larva of *A. theileri* var. *septentrionalis*, n., from Uganda and the Anglo-Egyptian Sudan, and of the female of *A. schwetzi*, sp. n., from the Belgian Congo and the French Sudan, together with morphological notes on the female, pupa and larva of *A. distinctus*, Newst. & Cart., and on the adults of *A. wellcomei*, Theo. The females of the group that includes *A. wellcomei*, *A. walravensi*, Edw., *A. distinctus*, *A. distinctus* var. *ugandae*, and *A. schwetzi* may be distinguished by characters shown in a key. Unusual characters common to larvae and pupae of *A. theileri*, Edw., *A. distinctus* and the above-mentioned varieties are discussed.

The adults of both sexes, pupa and larva of *A.* (*Myzomyia*) *wilsoni*, sp. n., and the female of *A.* (*Myzomyia*) *lovettae*, sp. n., are described from Tanganyika Territory. A new group name *Eomyzomyia* is erected for the former, and the latter is regarded as an aberrant species of the group *Neomyzomyia*. An examination of the pharyngeal cones of *A. rufipes* var. *ingrami*, Edw., from Sierra Leone, confirms the view that *A. rufipes*, Gough, belongs to the group *Neocellia*, but is atypical in possessing the propleural hair.

Notes are given on the morphology of the pharynx and male terminalia of *A. ardensis*, Theo., *A. machardyi*, Edw., *A. natalensis*, Hill & Haydon, and *A. multicinctus*, Edw., the last-named being considered merely a well marked colour variety of *A. natalensis*.

PATTON (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Species of the Genus** *Glossina* **Wiedemann based on a Comparative Study of the Male and Female Terminalia.**—*Ann. trop. Med. Parasit.* **28** no. 4 pp. 579–588, 7 figs. Liverpool, December 1934.

The author states that in order to understand the systematic position of the genus *Glossina* [*cf. R.A.E.*, B **23** 11], it is necessary first to compare the terminalia of typical examples of as many of the Muscoid genera as possible. In the present paper he describes those of both sexes of *Sarcophaga carnaria*, L., and *S. vicina*, Villen., and the segmentation of the male abdomen of the former.

Russell (P. F.). **Zooprophylaxis Failure. An Experiment in the Philippines.**—*Riv. Malariol.* **13** fasc. 5 pp. 610–616, 9 refs. Rome, 1934. (With a Summary in Italian.)

In an experiment carried out from 4th March to 9th May 1934 to test further the possible value of an " animal barrier " [*R.A.E.*, B **21** 230] against *Anopheles minimus* var. *flavirostris*, Ludl., the chief vector of malaria in the Philippines, Anophelines were caught inside a typical nipa house from 6 p.m. to 6 a.m., and on alternate nights 4 water buffalos were tethered, one on each side, at a distance of about 6 yards from the house. On these nights catches were also made on the animals. The house was about 50 yards from the nearest inhabited dwelling. In 473 periods, each lasting two hours, 718 Anophelines were taken indoors and 3,118 on the buffalos. The average number of unengorged females caught in the house was higher when the animals were in place. *A. minimus* var. *flavirostris* constituted 8·4 per cent. of the catches in the house and 6·5 per cent. of those on the animals. It therefore seems doubtful whether animals would protect individual houses in the Philippines against this Anopheline.

Zavattari (E.). **Acclimatazione della *Gambusia* e lotta antimalarica nel Fezzan.** [The Acclimatisation of *Gambusia* and antimalarial Work in Fezzan.]—*Riv. Malariol.* **13** fasc. 5 pp. 617–622. Rome, 1934. (With a Summary in English.)

Gambusia holbrooki was imported from Tripoli to Fezzan in 1931 and was found well established there in 1933. Although the water in this region is usually very hard and sometimes very saline, no visible differences were observed in the fish. In the oasis of Traghen and at Murzuch it greatly reduced the numbers of *Anopheles multicolor*, Camb. In addition to this Anopheline, *A. superpictus*, Grassi, and *A. sergenti*, Theo., also occur in other localities in Fezzan, and all three are vectors of *Plasmodium vivax*. As benign tertian is the prevalent form of malaria, the only measures required are small-scale drainage work and the use of *Gambusia*.

Pecori (G.) & Escalar (G.). **Relazione sulla campagna antimalarica nell'Agro Romano durante l'anno 1933.** [Report on the antimalarial Campaign in the Area round Rome during 1933.]—*Riv. Malariol.* **13** fasc. 5 pp. 623–668, 1 map, 2 graphs. Rome, 1934. (With a Summary in English.)

Anti-malarial work in the area round Rome during 1933 is briefly reviewed [*cf. R.A.E.*, B **22** 4]. The first males of *Anopheles maculipennis*, Mg., were taken on 8th April, and the last on 28th November. Paris green and Carburol were used against the larvae, the former in rural zones and the latter more especially nearer towns. Some 78,500 examples of *Gambusia* were placed in waters where they were rare or absent. The breeding of trout was continued on a property where their efficiency was proved by the absence of malaria since 1932. *Lemna* was also used in still waters. Although there were more Anophelines in some places in 1933 than in 1932, the percentage of malaria in man fell from 2·6 to 1·98. Except for a few examples

of *A. claviger*, Mg. (*bifurcatus*, auct.) taken in animal quarters in September, *A. maculipennis* was the only species observed ; all three types of eggs (grey, black and banded [*cf.* **22** 98, etc.]) were found.

Green (R.). **Annual Report of the Division of Malaria Research for the Year 1933.**—*Rep. Inst. med. Res. F.M.S. 1933* pp. 75–109. Kuala Lumpur, 1934.

In experiments in which Anophelines were fed on patients infected with *Plasmodium vivax* and *P. falciparum* that had undergone treatment with various drugs other than plasmochin, gametocytes continued their development in the mosquito unchecked, and it is concluded that at present there is no drug that affects both the crescent and ring forms of *P. falciparum*. Tables show the rate of experimental infection obtained in Malayan Anophelines during 1933 and the numbers that have been infected with various species of *Plasmodium* since 1929 [*cf. R.A.E.*, B **21** 87; **22** 39]. *Anopheles aconitus*, Dön., *A. hyrcanus* var. *nigerrimus*, Giles, *A. hyrcanus* var. *sinensis*, Wied., *A. karwari*, James, *A. kochi*, Dön., *A. maculatus*, Theo., *A. philippinensis*, Ludl., *A. subpictus* var. *malayensis*, Hack., *A. sundaicus*, Rdnw., and *A. vagus*, Dön., were all infected with *P. vivax* and *P. falciparum*, *A. annularis*, Wulp, with *P. falciparum* only, and *A. barbirostris*, Wulp, with *P. vivax* only. Attempts to trace the complete development of *P. malariae* in several of the above-mentioned species were unsuccessful. It has not been found possible to infect *A. aitkeni*, James, *A. leucosphyrus*, Dön., *A. separatus*, Leic., *A. tessellatus*, Theo., *A. asiaticus*, Leic., and *A. watsoni*, Leic., the last two species having refused to feed on man. A table shows the numbers of the other 16 species that have taken human blood. The duration of life after one blood meal in the first 12 ranged from 66 days in *A. maculatus* to 17 in *A. hyrcanus* var. *sinensis*. The sizes of the oöcysts of *Plasmodium falciparum*, *P. vivax*, *P. malariae* and *P. inuï*, and the difficulty of distinguishing them from one another are discussed. Sporozoites of *P. falciparum* and *P. vivax* were found in mosquitos as long as 48 and 26 days respectively after the infecting blood meal.

In June malaria parasites completed their development in *A. kochi*, *A. maculatus*, *A. philippinensis* and *A. vagus* in 8 days. Sporozoites were found in abundance not only in the salivary gland substance but also in the lumen of the gland. As various Malayan Anophelines have fed on man within 2 days of emergence, a mosquito may become infective in 10 days. A table shows the shortest times taken for sporozoites to appear in the salivary glands of several species of Anophelines. Among 11 species taken on a rubber estate malaria parasites were found only in *A. maculatus* (0·4 per cent.) and *A. umbrosus*, Theo. (0·7 per cent.), the latter being found infected for the first time for 15 years. Precipitin tests with 304 mosquitos from this estate showed human blood in 95 per cent. of *A. barbirostris* and *A. umbrosus*, in 93 per cent. of *A. maculatus* and in 80 per cent. of *A. separatus*.

During the year malaria parasites resembling *P. malariae* have been found in the great fruit bat (*Pteropus vampyrus*) and others resembling *P. falciparum* in a squirrel (*Sciurus vittatus*). Both animals occur in large numbers throughout the Malay Peninsula. It is probable that Anopheline mosquitos are capable of transmitting the parasites, and the problem of distinguishing the vectors of human malaria may be further complicated by the presence of these parasites in the mosquito.

Hodgkin (E. P.). **Annual Report of the Division of Entomology for the Year 1933.**—*Rep. Inst. med. Res. F.M.S. 1933* pp. 109–118. Kuala Lumpur, 1934.

A list is given of the 16 species of Anophelines from various places in Malaya dissected during 1933. This includes all those mentioned in the previous abstract except *Anopheles aitkeni*, James, *A. asiaticus*, Leic., and *A. watsoni*, Leic. The numbers of both adults and larvae of *A. maculatus*, Theo., taken on the rubber estate were smaller than in the previous year [*cf. R.A.E.*, B **22** 39] ; malaria parasites were found not only in the salivary glands and gut of *A. maculatus* but also in the glands of two examples of *A. karwari*, James. Natural gland infection of the latter does not appear to have been previously recorded. In both 1932 and 1933, the numbers of *A. maculatus* reached their maximum at the end of March and the beginning of April, decreased rapidly to a minimum in July and August, rose again in September, decreased gradually until the end of the year and remained small throughout January and February, so that conditions are least favourable to it during the two comparatively dry periods of the year. Findings regarding the positive correlation of adult and larval densities in *A. maculatus* and *A. karwari* and the preference shown by the former for human blood support those obtained in the previous year [*loc. cit.*].

Investigations into the increased prevalence of malaria in that part of the town of Batu Gajah that is situated near a large swamp showed that *A. maculatus* was rare. Larval surveys indicated that the most abundant species were *A. annularis*, Wulp, *A. aconitus*, Dön., *A. barbirostris*, Wulp, *A. hyrcanus*, Pall., and *A. vagus*, Dön., but in adult catches made in houses from April onwards, the predominant species was *A. barbirostris* (1,149), followed by *A. aconitus* (918), *A. hyrcanus* var. *nigerrimus*, Giles (267) and *A. hyrcanus* var. *sinensis*, Wied. (216), very few examples of other species being taken. Both gut and gland infections were found in about 3 per cent. of *A. barbirostris* and gut infections in one example of each of the two varieties of *A. hyrcanus*. The results of experiments on the length of the life-cycle of *A. maculatus* and on sluicing as a means of larval control have already been noticed [**22** 177].

Clemesha (W. W.). **Brief Account of the Natural History of Malaria in Ceylon.**—*Ceylon J. Sci.* (D) **3** pt. 3 pp. 157–172, 2 graphs. Colombo, 8th December 1934.

This paper on the transmission of malaria in the rural areas of Ceylon is based on data collected during the author's 8 years' sojourn on the Island. The only important vector of the disease is *Anopheles culicifacies*, Giles, which breeds chiefly in the clear, partly sunlit water of streams that are nearly dry from drought and flow over flat country at the foot of hills. Very small collections of water, such as foot-marks in the sandy bed of such streams and backwaters in which the water is less than an inch deep, usually contain many larvae, provided that they are sunlit. In towns breeding occurs in wells. In regular searches for larvae in two selected streams over a period of three years, none was found when they were in flood or nearly full, though large numbers were obtained in periods of drought during 3–4 months in each year. In the northern and central part of the Island, *A. culicifacies* increases during July–September, a period that is usually hot and dry. In the south-western part, it is found breeding during the period of drought,

which is in February–April. Long droughts are rare in the south-west but are of normal occurrence in the north ; consequently serious outbreaks of malaria are very rare in the south-west but common in the north. Minor breeding-places are of little importance in the malaria problem, since they are usually dry at the time of the normal increase of the mosquito. In general throughout the Island rice cultivation is not associated with malaria, and when outbreaks occur in the vicinity of rice-fields, there is invariably a stream nearby in which *A. culicifacies* is breeding. Isolated exceptions may be found in cases where rice-fields are surrounded by jungle. In Ceylon, the adults are intensely domestic and are found in large numbers in the dark corners of houses ; if driven out by smoke, they are found in the cow-shed nearest to the house. Malaria transmission does not usually occur above an altitude of 1,500–2,000 ft. The jungle to the north of the Island is intensely malarious, the chains of pools that become streams in wet weather being sufficiently numerous to keep the population of *A. culicifacies* at a fairly constant level and the forest affording ample protection for the adults.

Although it cannot be definitely stated that *Anopheles fluviatilis*, James (*funestus* var. *listoni*, List.) never carries malaria in Ceylon, it is obviously not responsible for serious outbreaks. The adults are not domestic and are difficult to catch even in cow-sheds ; the normal number of larvae are found in years when malaria is almost absent, and no increase in their numbers occurs in years when there are serious outbreaks ; and the rise in the curve of seasonal prevalence does not correspond to the onset of the disease as does that of *A. culicifacies*.

A. maculatus, Theo., which is pre-eminently a hill species, is usually most prevalent throughout the Island in December and January. Its larvae are very numerous in the rapid, clear hill streams. It is not associated with serious outbreaks of malaria, probably because the adults are not domestic and because the nights are too cold in the hills to allow the development of the sporozoites in the mosquito.

A careful study of the death rates and rainfall figures from a district in a highly malarious part of the Island for a period of over 30 years supports the conclusion that droughts in the critical months of July, August and September are always followed by outbreaks of malaria and high death rates in January of the following year. In years when rainfall in the same months is plentiful, there is remarkably little sickness of any kind.

Buxton (P. A.) & Lewis (D. J.). **Climate and Tsetse Flies : Laboratory Studies upon** *Glossina submorsitans* **and** *tachinoides*.—*Philos. Trans.* (B) **224** no. 512 pp. 175–240, 2 pls., 14 figs., 38 refs. London, 1934.

Nearly all work on populations of *Glossina* has so far been based on fly-counts, and although results of great value have been obtained, they are to some extent speculative, since they partly depend on the activity of the insects at the time of the count. The authors therefore undertook a study from February to June 1933 of the effect of climate on *Glossina* in the laboratory under controlled conditions of temperature and humidity, the work being carried out at Gadau, Nigeria. *Glossina tachinoides*, Westw., was chiefly used but many of the experiments were repeated with *G. morsitans submorsitans*, Newst. So far as is known, the physiological differences between the two are not very great.

The following is largely taken from the authors' summary : It seems that the effect of temperature on both puparium and adult is relatively simple. In the case of adults less than a week old and fed daily, exposure for an hour to 111·2°F. was fatal irrespective of humidity. The lower limit was less precisely defined, but exposures of up to two hours to 46·4 or 39·2°F. produced no permanent ill effect, whereas a temperature of 10·4°F. was invariably fatal after 7 minutes. The length of the pupal stage in both flies was shorter at 86°F. (about 3 weeks) than at 75·2°F. (about 4½ weeks). It was also shown that females kept at a high temperature deposit puparia that are below weight and give rise to small adults. This produces seasonal changes in the weight of newly emerged adults and may have a number of far-reaching consequences.

The effects of humidity are more complex and unexpected. For instance, adults of *G. tachinoides* were kept at 86°F. (roughly the mean annual temperature of the area in which the work was done) and offered food daily, groups being kept at different humidities. A humidity of 44 per cent. was near the optimum, the flies feeding and taking blood on 9 days out of 10 ; whereas at humidities above or below this figure they fed less frequently, and at 88 per cent. they nearly always refused to feed and died of inanition. It was also observed that adults of this species lived longest and produced the largest number of puparia at 44 per cent. humidity. At higher temperatures the effect of humidity is important, for in drier air the flies can survive for a short period temperatures [107·6–109·4°F.] that would be lethal in moist air. It was found that, in very dry air, the unfed fly burns additional fat, presumably in order to produce water of metabolism to compensate for the excessive evaporation.

Puparia are found in soil in shady places in a very stable environment ; the contrast between their life and that of the adults is very great. The optimum humidity, as determined by experiment, was close to saturation, which is surprising since there are large numbers of living puparia in the soil at the end of the dry season when the atmospheric humidity is very low and no rain has fallen for months. It is possible that the atmosphere in the soil spaces is nearly saturated owing to diffusion of water vapour from the deeper layers of the soil.

Observations on temperature and humidity made with recording instruments in open country and in the thickets, which are the permanent home of the fly, during one month in the rainy season and one month in the dry season supported the laboratory findings. At the end of the dry season, adults of *G. tachinoides* are abundant and many of the females are pregnant, and it was found that at that season the climatic conditions were close to the optimum as defined in the laboratory. Similarly, during the wet season, few of the females are pregnant, and it was found in the laboratory that high humidity alone, even when temperatures are known to be favourable and opportunities for feeding are frequent, causes the flies to die quickly, so that the birth rate is negligible. On the other hand, at the end of the dry season the shade temperatures are very high, often above 104°F. for three or four consecutive hours, conditions under which flies in the laboratory all died. Under natural conditions the lethal temperature may be a little higher than it is in an experimental receptacle, and it is possible that the flies avoid continuous exposure to such high temperatures by resorting from time to time to cooler spots, in animals' holes or among green leaves. The temperature at this season must, however, be nearly

lethal, and it seems likely that clearing undergrowth might kill large numbers of flies by exposing them to radiant heat at a time when temperature is high.

HORNBY (H. E.) & BAILEY (H. W.). **Trypanosomiasis Research.**—*Rep. Dep. vet. Sci. Anim. Husb. Tanganyika 1933* pp. 19–34. Dar-es-Salaam, 1934.

In the report for 1932 [*R.A.E.*, B **21** 283], it was suggested that most of the numerous cases of bovine trypanosomiasis that occur near Mpwapwa were due not to mechanical transmission but to infection by *Glossina pallidipes*, Aust., and during 1933 the matter was investigated on ecological lines. Mpwapwa is a semi-arid region depending for most of its water on streams from the mountains. Its typical vegetation is deciduous scrub in which none of the local species of tsetse-flies can survive during the dry season, but there are considerable areas covered with *Brachystegia-Berlinia* woodland suitable for *G. morsitans*, Westw., and smaller areas of riverine forest suitable for *G. pallidipes*. A few miles east of this practically fly-free country, the mountains form condensing scarps that are well-watered and covered with forest. Parts of this country form a permanent habitat for several species of tsetse-fly, including *G. morsitans* and *G. pallidipes*. The change, as represented by climate and vegetation, from the sub-humid region to the semi-arid one of Mpwapwa is fairly sharp, and the fly-infested woodland of the former is cut off from the fly-free woodland of the latter by belts of scrub wide enough to prevent the passage of *G. morsitans*. On the other hand, the fly-free riverine forest is to a great extent linked to the permanent fly-belt by evergreen forests fringing the streams, which come from the mountains and penetrate for long distances into the dry country. During the past few years *G. pallidipes* has been advancing along these stream-beds and rendering more and more of the watering-places unsafe. The particular farm on which most of the losses occurred lies 4–5 miles west of a belt of fringing forest which is linked directly with the main fly-belt and in which *G. pallidipes* was firmly established by the first half of 1933. The intervening country is chiefly occupied by *Acacia spirocarpa*, which represents a stage in the succession towards deciduous scrub. The farm itself includes a considerable area of riverine forest, and in 1933 boys with bait cattle had no difficulty in catching odd flies almost daily in July and August. The incidence of trypanosomiasis among the cattle on the farm became so great that they were moved elsewhere. According to a survey botanist, Mr. B. D. Burtt, *G. pallidipes* is extending its permanent habitat by direct advance along the strips of fringing forest, and towards the end of the rainy season, when this type of forest is choked with long grass, it tends to move into the surrounding scrub, which is shady at that time, being liable to be carried distances of several miles along cattle tracks, footpaths and motor roads. Even when the advance of the dry season has forced the fly to return to the fringing forest, it is still liable to be carried on natives and cattle from the watering places to localities several miles away provided that a certain amount of foliage persists close to the paths. Only when leaf-fall in the scrub is complete and the *Acacia* woodland has been swept by fire, is the carriage of flies from the sides of streams inhibited. Owing to knowledge of the habitats of *G. morsitans* and *G. pallidipes*, the fact that the former is prevalent less than 20 miles from the farm is not

causing anxiety, and it is considered that making large breaks in the continuity of the fringing forest will check the further spread of the latter and also break up the present large communities into such small ones that the fly population in each can be exterminated by various methods of starvation and trapping. Two strips of clearing 1,000 yards long have been begun, and as it is believed that what has already been accomplished will protect the farm, the herds have been brought back.

Corson (J. F.). **Experimental Transmission of** *Trypanosoma rhodesiense* **through Antelopes and** *Glossina morsitans* **to Man.**—*J. trop. Med. Hyg.* **38** no. 1 pp. 9–11, 3 refs. London, 1st January 1935.

The author describes experiments carried out in Tanganyika Territory, that were undertaken to determine whether sleeping sickness trypanosomes retain their transmissibility by tsetse-flies and their infectivity for man while living in animals in nature [*cf. R.A.E.*, B **20** 98]. Although attempts to transmit *Trypanosoma rhodesiense* from man to laboratory animals by means of the bites of *Glossina morsitans*, Westw., were not successful, the infection was transmitted from guinea-pigs (inoculated directly from the same patient) by means of the bites of single flies to a series of antelopes (dik-dik) and finally about a year later to man.

Lewis (E. A.). **A Study of the Ticks in Kenya Colony. The Influence of natural Conditions and other Factors on their Distribution and the Incidence of Tickborne Diseases. Part III. Investigations into the Tick Problem in the Masai Reserve.**—*Bull. Dep. Agric. Kenya* no. 7 of 1934, 65 pp., 2 figs., 43 refs. Nairobi, 1934.

In continuation of work on ticks in Kenya Colony [*R.A.E.*, B **20** 21, 224], investigations were carried out in January–March, July and November–December 1932 and in January 1933 in the Masai Reserve. The climate and soil of this area are described, and the native population and the wild and domestic animals are discussed. The hosts and distribution of the 30 species of ticks encountered are given and summarised in a table. The following were found on domestic animals: *Amblyomma gemma*, Dön., *Haemaphysalis aciculifer*, Warb., *Hyalomma aegyptium*, L., *Rhipicephalus kochi*, Dön., and *R. maculatus*, Neum., on cattle; *Boophilus annulatus decoloratus*, Koch, *Hyalomma aegyptium dromedarii*, Koch, *H. aegyptium impressum*, Koch, *Rhipicephalus appendiculatus*, Neum., and *R. neavei*, Warb., on cattle and sheep; *Amblyomma variegatum*, F., on cattle, sheep and goats; *R. evertsi*, Neum., on cattle, sheep, goats and a donkey; *R. pulchellus*, Gerst., on cattle, sheep, goats, dogs and horse; *R. simus*, Koch, on cattle, sheep and dogs; *Ixodes pilosus*, Koch, on cattle and goats; *Dermacentor rhinocerotis*, DeG., on a donkey; and *Haemaphysalis leachi*, Aud., on dogs. *Rhipicephalus evertsi* and *Amblyomma variegatum* are the most abundant and widely distributed species.

Sweating sickness of calves is said by the natives to be carried by ticks, and in a case seen by the author *Hyalomma aegyptium impressum* was found in the ears. The vector of heartwater, *A. variegatum*, is abundant, and this is possibly the reason why the disease is not apparent and that stock are immune from it. Nairobi sheep disease appears to be confined to the vicinity of Ngong, although it may exist in some other small areas. African coast fever is not evenly distribute d

in the Reserve, but both the disease and its principal vector, *R. appendiculatus*, are prevalent in many areas. Anaplasmosis has been observed, but redwater, which is said to be confined to the wooded parts of the Reserve, was not noticed. The bites of the immature stages of *R. pulchellus* cause much annoyance to man and cattle. The paper concludes with a discussion, chiefly on *R. appendiculatus* and the necessity for taking steps to control it.

KOUWENAAR (W.) & WOLFF (J. W.). **Onderzoekingen over Sumatraansche Rickettsiosen.** [Investigations on Sumatran Rickettsia Diseases.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 25 pp. 1659–1670, 1 pl., 14 refs. Batavia, 4th December 1934. (With a Summary in English.)

This paper describes investigations in Sumatra in connection with the question whether Sumatran pseudotyphus or mite fever, which is transmitted by *Trombicula deliensis*, Walch [*R.A.E.*, B **13** 84], may be also transmitted by ticks.

Suspensions of crushed examples of *Dermacentor auratus*, Sup., *Rhipicephalus haemaphysaloides*, Sup., and *Haemaphysalis papuana*, Morelli, collected on wild pigs (*Sus vittatus*) when inoculated into guineapigs, etc., produced an infection characterised by the occurrence of rickettsiae in the tissues of the animals but showing pathological symptoms different from those of mite fever. Positive results were obtained with each species of tick.

NICOLLE (C.) & SPARROW (H.). **Quelques expériences sur le virus de la fièvre fluviale du Japon (Tsutsugamushi).**—*C. R. Acad. Sci. Fr.* **199** no. 24 pp. 1349–1351. Paris, 1934.

Experiments are recorded on the virus of tsutsugamushi disease in laboratory animals. It gave no immunity from Tunisian or Chinese strains of epidemic typhus. It persisted in lice [*Pediculus humanus*, L.] for 7 days, but was not transmitted by their bites. It was preserved for at least 11 days in *Xenopsylla* (*Pulex*) *cheopis*, Roths., and this flea transmitted it by biting.

HANDSCHIN (E.). **Studien an *Lyperosia exigua* Meijere und ihren Parasiten. II. Teil. Die natürlichen Feinde von *Lyperosia*.** [Studies of *L. exigua* and its Parasites. Part II. The natural Enemies of *Lyperosia*.]—*Rev. suisse Zool.* **41** no. 1 pp. 1–71, 24 figs., many refs. Geneva, February 1934. **III. Teil. Die Anziehung von *Spalangia* zu ihrem Wirte.** [Part III. The Attraction of *Spalangia* to its Host.]—*T.c.*, no. 14 pp. 267–297, 7 figs., 9 refs. March 1934.

These papers are parts of a series [*cf. R.A.E.*, B **21** 257] on studies during 1930–32 on *Lyperosia exigua*, de Meij., and its natural enemies in the Netherlands Indies and Australia, and comprise information that has already been noticed from a briefer account [B **20** 258].

The following is taken from the author's summary of the second part : Next to the species of *Spalangia* the most important pupal parasites were *Aleochara handschini*, Scheerpeltz, and *A. windredi*, Scheerpeltz, described in 1934 from the Sunda Islands and Australia, respectively. Staphylinids were constant parasites, at least in Australia, where *A.*

windredi becomes numerous with increasing dryness of weather when both *Spalangia* and *Lyperosia* begin to disappear and reaches its maximum at the beginning of the rainy season in October. In low land *A. handschini* emerges from the puparia as an adult, but in mountainous regions as a third-stage larva, which enters upon a pupal period of 4 days. It is suggested that the ecology of species of the genus *Scatophaga* should be studied as the larvae prey on other larvae in dung while the adults prey on other adult flies.

ESAKI (T.). **A Case of facultative " Blood-sucking " in *Cyrtorrhinus lividipennis* Reuter, with Notes on the same Habit in some Typhlocybinae (Hemiptera, Miridae).** [*In Japanese.*]—*Mushi* **7** no. 2 pp. 97–100, 1 fig., 3 refs. Fukuoka, Japan, December 1934.

A Jassid of the genus *Erythroneura* that is abundant on mulberry in the Loochoo Islands is attracted at night by lights in houses and pierces the skin on coming into contact with the face or hand. The Capsid, *Cyrtorrhinus lividipennis*, Reuter, which is recorded for the first time from Japan and Korea and is illustrated and described, causes similar injury.

POOLE (L. T.) & SACHS (A.). **Preliminary Results of an Investigation into the Aetiology of Sandfly Fever.**—*J. R. Army med. Cps* **63** no. 2 pp. 73–79, 11 refs. London, August 1934.

SHORTT (H. E.), POOLE (L. T.) & STEPHENS (E. D.). **Sandfly Fever on the Indian Frontier. A Preliminary Note on some Laboratory Investigations.**—*T.c.* no. 6 pp. 361–367 ; *Op. cit.* **64** no. 1 pp. 17–24, 5 charts, 10 refs. December 1934 and January 1935.

In the Peshawar district, where it is endemic, sandfly fever accounts for 13·6 per cent. of all admissions to hospitals and, next to malaria, is the most prevalent disease among the troops. It is non-fatal and of short duration ; it occurs in epidemic form during the summer months, reaching its maximum in June–July, and disappears in October. A very definite degree of immunity is developed among troops that have experienced one season in an endemic area. The investigation described in the first paper showed that the disease known as sandfly fever in the Peshawar District agrees with the clinical description of the disease elsewhere and that it is not associated with the presence in the blood of leptospira or any other visible micro-organism.

Laboratory findings on sandfly fever that have been recorded by other workers are listed in the second paper, and an account is given of attempts made at Kasauli (a non-endemic area) to repeat these results in order to demonstrate the identity, or at least the essential similarity, of the Indian form of the disease with that occurring in other parts of the world. The investigations on the transmission of the disease by *Phlebotomus papatasii*, Scop., and the length of the incubation period in the sandfly have already been noticed [*R.A.E.*, B **22** 159].

MOHLER (J. R.). **Report of the Chief of the Bureau of Animal Industry, 1934.**—52 pp. Washington, D.C., U.S. Dep. Agric., 1934.

In studies on the application of the complement-fixation test in the diagnosis of anaplasmosis, specific antigens were demonstrated in infected nymphs and adults of the tick, *Rhipicephalus sanguineus*,

Latr., when tested against a serum from an active case of the disease, but not in uninfected adults. Specific antigens were demonstrated in engorged females of *Boophilus annulatus*, Say, obtained from cattle infected with tick-fever [*Piroplasma bigeminum*], when tested with the serum of an animal known to be affected with pure anaplasmosis and with the serum of a second animal known to be affected with piroplasmosis but in which anaplasmosis could not be absolutely excluded. Infected larvae of this species showed similar antigenic value. Females of *Aëdes aegypti*, L., that had fed on a carrier of anaplasmosis were permitted to engorge 9 days later on a susceptible splenectomised cow. Transmission of anaplasmosis did not occur as judged by failure of the test cow to react.

In the campaign for the eradication of *Boophilus annulatus*, a further area of over 13,000 square miles was released from Federal Quarantine and no areas were re-quarantined, so that the quarantined area has been further reduced from 12 per cent. [not one-twelfth as erroneously stated (*R.A.E.*, B **22** 57)] to 11 per cent. of its original size.

Anaplasma marginale appears to be digested by the ticks, *Dermacentor variabilis*, Say, and *D. venustus*, Banks (*andersoni*, Stiles). It could not be differentiated in the epithelial cells of the digestive tract of the tick in the stage that had ingested it, nor in the salivary glands of the next stage, which transmitted anaplasmosis to susceptible cattle. This suggests that the causal agent of the disease is ultramicroscopic in the tick. When examples of *Boophilus annulatus* and *Rhipicephalus sanguineus* infected with anaplasmosis were triturated in normal saline and injected intravenously into susceptible cattle, no disease and no immunity were produced, whether the emulsion was filtered through a Seitz filter or not. When ticks from the same lot were allowed to engorge, however, *B. annulatus* transmitted *Piroplasma* (*Babesia*) *argentinum* and *R. sanguineus* transmitted anaplasmosis.

In the central zone of an area in Colorado in which a campaign for the eradication of cattle grubs [*Hypoderma*] is being carried out, the number of larvae per animal was 4·9 as compared with 5·1 for the previous year [*cf.* **22** 57]. The failure to reduce the number to below about 5 larvae per animal is attributed to infestation from untreated herds. In a field experiment, about 3,000 head of cattle were successfully treated by means of the small medicated rods [*loc. cit.*], but fatal malignant oedema developed later in 8 cases. Experiments to find an effective method of rendering the rods safe against anaerobic infection indicated that the addition of colloidal iodine to the formula prevents infection with malignant oedema. The result of further tests on farm and range sheep indicate that pine tar and pine-tar oils do not repel *Oestrus ovis*, L., nor prevent it from depositing its larvae in or around the nostrils of sheep.

Insects serving as intermediate hosts of two parasitic worms that infest fowls are recorded [**21** 118]. A dung beetle, *Aphodius granarius*, L., a Staphylinid, *Oxytelus* sp., and young grasshoppers were found to be intermediate hosts of *Hymenolepis variabilis*, a cestode of crows, but both field and laboratory observations indicate that *A. granarius* does not serve as an intermediate host for *H. cantaniana*, a related cestode of poultry. Grasshoppers and cockroaches have been shown to be intermediate hosts of the crow stomach worm, *Microtetrameres helix*, with which pigeons were experimentally infected; and a Carabid, *Celia muscula*, Say, to be an intermediate host of *Raillietina magninumida*, a guinea-fowl cestode.

A 5 per cent. mixture of orthophenylphenol in hydrated lime or kaolin dusted into the feathers of fowls effectively destroyed the louse, *Eomenacanthus stramineus*, Nitzsch (*Menopon biseriatum*, Piag.). A 4 per cent. solution of pure coconut-oil soap in water killed *Haematopinus adventicius chinensis*, Fahrenh. (*suis*, auct.) on pigs. All lice and about 10 per cent. of their eggs were destroyed by a 50 per cent. dilution of acetone but a 12·5 per cent. dilution was apparently ineffective. Treatment of canine sarcoptic mange [*Sarcoptes canis*, Gerl.] with derris powder containing 5 per cent. rotenone gave promising results.

MAYER (K.). **Die letale Dosis Aethylenoxyd bei** *Calandra granaria*, *Tribolium confusum* **und** *Cimex lectularius*. [The lethal Dose of Ethylene Oxide for *C. granaria*, *T. confusum* and *C. lectularius*.] —*Arb. physiol. angew. Ent. Berl.* **1** no. 4 pp. 257–266, 2 figs., 14 refs. Berlin, December 1934.

An account is given of experiments with ethylene oxide in the form of T-gas (10 parts ethylene oxide and 1 part carbon dioxide) [*R.A.E.*, A **21** 436] made to determine its effect on insects and to discover if a reduction in fumigation time [B **21** 60] was possible. The test insects were exposed for a given time to a stream of air containing a known quantity of T-gas and supplied by an exact apparatus, which is figured and described. The insects were then kept under observation for several days to ascertain the period during which the delayed action of ethylene oxide occurs [B **20** 80], and it was found that an allowance of 10 days was ample. The results of the 23 tests are tabulated. With low concentrations the delayed action occurred up to 10 days, whereas with high concentrations it generally took place on the second and third days. Haber's formula, in which the working effect of the gas is obtained by multiplying the concentration in mgm. per cu. m. by the fumigation time in minutes required to produce mortality, proved applicable to investigations with insects, and the toxicity curve of ethylene oxide resembled that of phosgene. Thus in the case of ethylene oxide the smallest lethal gas-concentration for the larvae of *Cimex lectularius*, L., was 40 mgm. per litre with an exposure of 100 minutes, or alternatively, 100 mgm. per litre with an exposure of 40 minutes. The larva of *Cimex*, which was more resistant than any stage of either of the two beetles used in the tests, was twice as resistant as the adult, and seven times as resistant as the egg.

DRUMMOND (F. H. N.). **West Australian Simuliidae.**—*J. roy. Soc. W. Aust.* **18** (1931–32) pp. 1–12, 3 pls., 9 refs. Perth, 1933. [Recd. January 1935.]

Five species of Simuliids occur in the Darling range area of Western Australia, *Simulium ornatipes*, Skuse, *S. tonnoiri*, sp. n. (described here), *S.* (*Austrosimulium*) *bancrofti*, Taylor, and 2 unidentified species. From observations during March to November the author concludes that these flies breed all the year round where there is running water, except that one of the undetermined species apparently has a very brief breeding period in the winter months. *S. tonnoiri* appeared to be the most widely distributed. Females of *S. bancrofti*, which is the only troublesome species and is particularly so in spring and early

summer, bit freely in captivity if they had been taken in the field, but not if they had been bred in the laboratory. A starved dragonfly larva devoured 8 Simuliid larvae in 10 minutes.

SHANNON (R. C.) & PUTNAM (P.). **The Biology of Stegomyia under Laboratory Conditions: I. The Analysis of Factors which influence Larval Development.**—*Proc. ent. Soc. Wash.* **36** no. 7 pp. 185–216, 9 figs., 15 refs. Washington, D.C., October 1934. **II. Egg-laying Capacity and Longevity of Adults.**—*T.c.* pp. 217–242, 5 figs., 7 refs.

In the course of two years' work at the Yellow Fever Laboratory in Bahia, Brazil, a standard method of rearing *Aëdes aegypti*, L., specially adapted to tropical laboratories, was devised. When this method was used, the rate of development of all stages was uniform, mortality was low, and the adults appeared to be of maximum size and vigour; consequently excellent material of known age and in the desired quantity was easily available for experiments. From 100 to 250 females and an equal number of males are kept in a screened cage of about 18 cu. ft. capacity containing flat pans with a layer of wet cotton-wool about 1 inch thick covered with filter paper for oviposition and a dish of raisins. An immobilised guineapig is supplied every third or fourth day. This number of females will produce 500–1,000 eggs daily. Fresh adults are added once a month. Larvae are reared in any uncovered dish or jar with a capacity of $1\frac{3}{4}$ pts. and pupae are isolated in Wassermann tubes plugged with cotton-wool and stored in wire racks. Single females are kept in screened cages 12 by 12 by 16 inches with cloth sleeves, each containing one petri dish with wet cotton wool and one with honey overlaid with filter paper. Since the embryo has not yet begun to form at the time of oviposition, the eggs are left in the pans and placed in the open air to dry slowly. The time required for the embryo to reach a state for immediate hatching is 2–3 days at 25–27°C. [77–80·6°F.] and at least 4–5 days at 23·5°C. [74·3°F.]. Eggs thus conditioned may be dried and, if used within a month, serve as well as freshly conditioned eggs for routine rearing; some may survive for more than a year. Eggs dried before the embryos mature show a high mortality. Properly conditioned moist eggs, when submerged in water with food will hatch within 10 minutes. The larvae, at the rate of 100 per jar, may be reared in ordinary tap water with about 2 cc. dried bread; dried blood serum in place of bread or a combination of both may also be used. Bacteria develop rapidly in the water, and the larvae appear to be fully nourished. The pupae are removed every morning by means of a large-bore pipette, and the tubes containing them are examined daily for adults.

The first paper deals with the immature stages. Experiments on the hatching of the eggs and on the effect of starvation and overcrowding of the larvae, and two series of observations on pupation and emergence periods are discussed. The results are statistically analysed in order to define relationships and set up norms for comparison with the results of subsequent experiments.

In experiments at 24°C. [75·2°F.], both the total incubation period and the time between the hatching of the first and last eggs of a batch decreased as the mean number of hours of conditioning increased from 12 to 70, the hours required in the last case being 94 and 24

respectively. When the eggs were conditioned for a mean of 99 hours they all hatched within 10 minutes of submergence. If freshly hatched eggs are placed in water immediately, complete eclosion takes much longer. Larvae were able to complete development on an amount of food wholly inadequate for *Culex fatigans*, Wied. (*quinquefasciatus*, Say). Although they may survive for a considerable period on a minute quantity of food, pupation does not necessarily occur. The effect of overcrowding appears to be brought about by improper nourishment due to the massing habits of the larvae rather than by an excess of toxic substances, since small numbers of larvae passed through a normal cycle when placed in water previously fouled by large numbers. With a temperature range of 23–27°C. [73·4–80·6°F.] and a maximum of 100 larvae per jar, pupation occurred in an average of 6–7 days.

The statistical analysis of figures obtained from 61 lots of 100 eggs at 25°C. [77°F.] showed that the egg and larval mortality was 12·41 per cent., the pupal mortality 6·81 per cent., and the average periods from hatching to pupation 7·16 days and to emergence 9·05 days for males and 9·74 for females. For 5 lots at 27°C. [80·6°F.] the corresponding figures were 6·67 and 1·93 per cent. and 6·40, 8·09 and 8·72 days respectively.

In the second paper, factors that influence the egg-laying capacity and longevity of females of *A. aegypti* are considered, and the results of statistical analysis of the data obtained in a series of observations on females bred in the laboratory at an average summer temperature of 80·6°F. are given. The mean age of 29 females at the time of the first blood meal was 2·8 days, and the minimum period between the first blood meal and the first oviposition for 8 lots of females was 3·4 days. The number of eggs deposited increased with the life of the female, the amount of blood consumed and the number of batches laid, but was most closely associated with the number of batches laid. Actual length of life apparently affected the number of eggs laid less that either of the other two factors. The effect of all three on total egg production is given final mathematical expression. Weekly egg-laying rates for 118 females dropped at the rate of 15 per cent. per week. An equation is set up whereby the weekly performance at specific ages in the lifetime of a similar group may be estimated. A mean maximum of 350 eggs per female living until limit of egg-laying capacity had been reached was computed from this equation. A comparison of longevity showed that practically none of 190 females fed only on honey and water died until the tenth week (the mean age at death being 82·2 days), whereas deaths among 118 fed on blood were distributed throughout the period of survival (the mean age being 62·2 days). As longevity, feeding habits and egg-laying capacity in nature are very imperfectly known, it is impossible to apply this analysis, based wholly on laboratory findings, to problems in the field.

JOHANNSEN (O. A.). **Aquatic Diptera. Part I. Nemocera, exclusive of Chironomidae and Ceratopogonidae.**—*Mem. Cornell agric. Exp. Sta.* no. 164, 71 pp., 24 pls., 7 pp. refs. Ithaca, N.Y., 1934.

Keys are given to the larvae and pupae of the North American families and genera, with notes on the characters and habitats of some of the genera and species.

WAGNER (J.). **Aphanipterologische Notizen. III. Ein Fall der Morphose beim Floh der Hausmaus** (*Ctenopsyllus segnis*). [Notes on Siphonaptera. III. A Variation in Morphology in *Leptopsylla sgenis*, the Flea of the House Mouse.]—*Konowia* **13** no. 4 pp. 253–259, 4 figs. Vienna, 15th December 1934.

Comparative descriptions are given of *Leptopsylla* (*Ctenopsyllus*) *segnis*, Schönh., occurring on various mice, and of a form found on a squirrel in Jugoslavia, for which the name *L.* (*C.*) *segnis* f. *sciurobius* is proposed.

WAGNER (J.). **Weitere Einteilung der Gattung** *Ceratophyllus* **Curtis.** [A further Division of the Genus *Ceratophyllus* Curtis.]—*Konowia* **13** no. 4 pp. 260–263. Vienna, 15th December 1934.

The author discusses, and in one case extends, the scope of some of the genera into which Jordan [*R.A.E.*, B **21** 286] divided the genus *Ceratophyllus* (*sens. lat.*), with particular reference to Palaearctic species.

FOLSOM (J. W.) & WARDLE (R. A.). **Entomology with special Reference to its Ecological Aspects.**—4th revd edn, Demy 8vo, ix + 605 pp., 5 pls., 308 figs., 32 pp. refs. Philadelphia, Pa, P. Blakiston's Son & Co., Inc.; London, J. Murray, 1934. Price 21*s*.

In his revision of this book [*cf. R.A.E.*, A **11** 343], the junior author has left unchanged the general structure, but has added much new information and has remodelled several chapters, particularly those dealing with the relation of insects to disease and to man. The addition of many new references to the bibliography, which is arranged under subjects, has necessitated the deletion of many of the old ones, but all of historical or general value have been retained. Indices to authors and subjects are appended.

[PAVLOVSKIĬ (E. N.).] **Павловский (E. H.). Ueber die höhlenbewohnenden** *Ornithodorus*-**Arten Turkmeniens und ihre Beziehung zum Zeckenfieber.** [Species of *Ornithodorus* occurring in Burrows in Turkmenistan and their Relation to the Transmission of Tick-borne Relapsing Fever.] [*In Russian.*]—*Trud. Karakal. i Kzuil-Atreksk. parazit. Eksped. 1931 i Mater. po Faune Turkm.* in *Trud. Sov. Izuch. proizv. Sil*, Ser. turkmensk. pt. 6 pp. 29–47, 9 figs., 11 refs. Leningrad, Acad. Sci., 1934.

In the summer of 1931 collections of species of *Ornithodorus* were made in the Karakala region of south-western Turkmenistan to ascertain if they can transmit *Spirochaeta sogdiana*, the causal agent of Central Asiatic relapsing fever [*cf. R.A.E.*, B **18** 7; **19** 255; **23** 6, etc.]. *O. papillipes*, Bir., was taken in a large cave inhabited by porcupines, and *Ornithodorus* sp. in burrows of tortoises, rodents and other animals, in nests of birds made in holes in the sides of ravines, and among stones.

Experiments with these ticks and some collected in 1930 near Ashkhabad (a little further east), including *O. tartakovskyi*, Olen., from the burrows of rodents, were conducted in Leningrad in October and November, the results being shown in tables. Since no infection was produced in guineapigs when the ticks fed on them, the latter were probably not infected under natural conditions. Furthermore the

disease was not transmitted when ticks from burrows were fed on guinea-pigs infected with *S. sogdiana* and then fed on, or injected into, healthy ones. On the other hand, infection was produced in *Mesoricetus auratus* and a hedgehog (*Paraechinus*) by the bites of infected individuals of *O. papillipes*, though the spirochaetes subsequently disappeared from their blood. No spirochaetes were found in bats, hedgehogs (*Hemiechinus*) or rodents in nature, but the susceptibility of porcupines to infection should be further investigated, as *O. papillipes* is found in their burrows.

[PETRISHCHEVA (P. A.).] **Петрищева (П. А.). Epidemiologie der Malaria des Karakala-Gebietes.** [Epidemiology of Malaria in the Karakala Region.] [*In Russian.*]—*Trud. Karakal. i Kzuil-Atreksk. parazit. Eksped. 1931 i Mater. po Faune Turkm.* in *Trud. Sov. Izuch. proizv. Sil.* Ser. turkmensk. pt. 6 pp. 49–83, 9 figs., 4 graphs, 2 fldg maps. Leningrad, Acad. Sci., 1934.

A detailed account is given of the malaria situation in the Karakala region of south-western Turkmenistan to the end of 1931, of the various types of water that serve as breeding-places for Anophelines and of the biology of the predominant species, *A. superpictus*, Grassi. An abridged version has already been noticed [*R.A.E.*, B **20** 117].

[PETRISHCHEVA (P. A.).] **Петрищева (П. А.). Zur Fauna und Biologie der Culicidae des Karakala-Gebietes.** [Contribution to the Fauna and Biology of Culicids of the Karakala Region.] [*In Russian.*]—*Trud. Karakal. i Kzuil-Atreksk. parazit. Eksped. 1931 i Mater. po Faune Turkm.* in *Trud. Sov. Izuch. proizv. Sil*, Ser. turkmensk. pt. 6 pp. 85–104, 6 figs., 1 graph, 1 ref. Leningrad, Acad. Sci., 1934.

The 15 species of mosquitos found in the Karakala region (south-western Turkmenistan) in 1930 included 6 of the genus *Anopheles* [*cf.* *R.A.E.*, B **19** 26], *viz.*, *A. superpictus*, Grassi, which was the most common, *A. maculipennis*, Mg., *A. claviger*, Mg. (*bifurcatus*, auct.), *A. hyrcanus* var. *pseudopictus*, Grassi, *A. pulcherrimus*, Theo., and *A. plumbeus*, Steph. The last three were rare. Notes on the breeding-places are summarised in a table. Larvae of *A. superpictus* occurred from May till the end of November in almost all types of water, especially in spring water exposed to the sun, along the pebbly banks of rivers and streams, and in flooded areas with a very slow current and sparse vegetation. They were often found, together with those of *A. claviger*, in wells in which the water was very high, and in one instance larvae, pupae and empty pupal skins occurred in a deep well situated in a gloomy mine gallery. As the walls of the well were of hard rock and there was no vegetation, the author believes that the larvae of *A. superpictus* can develop on the colloid substances dispersed in water if coarser particles in suspension are absent [*cf.* **19** 25; **20** 153]. Larvae of *A. claviger*, which were found throughout the year, occurred in a variety of breeding-places, including water exposed to the direct rays of the sun, streams almost hidden in dense grass, and in one instance water from a sulphur spring devoid of macroscopic organic matter. Larvae of *A. maculipennis* occurred from May till the end of November in large shallow accumulations of water formed by the overflow of irrigation ditches and covered with grasses, and sometimes along pebbly river banks.

The adults of *A. superpictus* were predominant in dwellings and outhouses, while *A. maculipennis* occurred much less frequently, and *A. claviger* very rare. On the whole, mosquitos were most numerous in gorges, caves and burrows of animals, reeds, etc., at a distance of from 6 to 25 miles from human habitations. *A. superpictus*, which was again predominant, was found at altitudes up to 6,500 ft., *A. claviger* up to 5,000 ft., and *A. maculipennis* up to 2,500 ft., while other Anophelines occurred in valleys up to an altitude of 1,600 ft. The adults of *A. superpictus* and *A. maculipennis* were found throughout the year, the former being most numerous in August and September. *A. claviger* was obtained from April to the end of November, *A. hyrcanus* var. *pseudopictus* from June to the end of August, and *A. pulcherrimus* in July and August only.

[Perfil'ev (P. P.).] **Перфильев (П. П.). Zur Fauna, Systematik und Verbreitung der Phlebotomus-Arten Turkmeniens.** [Contribution to the Fauna, Classification and Distribution of Sandflies in Turkmenistan.] [*In Russian.*]—*Trud. Karakal. i Kzuil-Atreksk. parazit. Eksped. 1931 i Mater. po Faune Turkm.* in *Trud. Sov. Izuch. proizv. Sil*, Ser. turkmensk. pt. 6 pp. 105–117, 8 figs., 35 refs. Leningrad, Acad. Sci., 1934.

A list is given of 15 sandflies recorded by various workers from Turkmenistan [*cf. R.A.E.*, B **18** 9; **19** 26, 172; **21** 96, 98], including *P. wenyoni*, Adl., Thdr. & Lourie, with notes on the local distribution and dates of capture of each. Descriptions are given of the pharynx and spermatheca of the female of *P. wenyoni*, of the buccal armature, pharynx and spermatheca of the females of *P. pawlowskyi*, Perfil'ev, *P. squamipleuris*, Newst., *P. minutus* var. *arpaklensis*, Perfil'ev, and *P. sumbaricus*, Perfil'ev, and of the external genitalia, pharynx and buccal armature of the males of *P. squamipleuris* and *P. sumbaricus*, and all these forms are compared with allied species. *P. stalinabadi*, Khod. & Sofiev, is considered a synonym of *P. sogdianus*, Parrot, on the basis of a description of the latter species that appeared in 1930 [*cf.* **19** 11, 173].

[Pavlovskiĭ (E. N.).] **Павловский (Е. Н.). Ueber Miasen in Turkmenien.** [On Myiasis in Turkmenistan.] [*In Russian.*]—*Trud. Karakal. i Kzuil-Atreksk. parazit. Eksped. 1931 i Mater. po Faune Turkm.* in *Trud. Sov. Izuch. proizv. Sil*, Ser. turkmensk pt. 6 pp. 119–140, 6 figs., 34 refs. Leningrad, Acad. Sci., 1934.

General information is given from the literature on different types of myiasis and the flies causing them; and cases are described, observed in Turkmenistan in May 1928, August 1931 and September 1932, respectively, of severe infestation of the anal region of a donkey by *Wohlfahrtia magnifica*, Schin., and of fatal myiasis in two native women. In one of the human cases the larvae occurred in the tissues covering the cranium, and in the other in the nostrils and nasal cavity. In neither instance were the larvae identified, but the symptoms indicate that the species may have been *W. magnifica*. The other species of *Wohlfahrtia* that have been recorded from the Russian Union are *W. intermedia*, Portsch., *W. balassogloi*, Portsch., *W. meigeni*, Schin., and *W. tetripunctata*, Duf. Notes are given on the character of the myiasis caused by *Wohlfahrtia*, which is compared with that caused by *Calliphora erythrocephala*, Mg., and on the use of blow-fly larvae for

the treatment of wounds [*R.A.E.*, B **20** 125, etc.], and instructions are appended for the collection of information on myiasis and the preservation and rearing of the larvae responsible.

[PAVLOVSKIĬ (E. N.).] **Павловский (Е. Н.). Ueber einen möglichen Anteil des Pillendrehers** (*Scarabaeus*) **an der Verunreinigung von Gewässern.** [The possible Participation of the Sacred Dung Beetles (*Scarabaeus sacer*) in the Pollution of Water Reservoirs.] [*In Russian.*]—*Trud. Karakal. i Kzuil-Atreksk. parazit. Eksped. 1931 i Mater. po Faune Turkm.* in *Trud. Sov. Izuch. proizv. Sil*, Ser. turkmensk. pt. 6 pp. 141–148, 4 figs. Leningrad, Acad. Sci. 1934.

Scarabaeus sacer, L., is very common in western Turkmenistan, and in some places with a sparse population the adults help to maintain sanitary conditions in latrines by carrying away the contents. Since, however, in doing so they become soiled with faeces, there is a danger of their introducing faecal bacteria, helminth eggs and cysts of Protozoa into water in wells, etc. A well with a wide shaft and earthen walls was found to contain dead bodies of beetles, most of which were *S. sacer*. In laboratory experiments in the summer of 1933 in southern Turkmenistan, cultures from emulsions from the digestive tract or surface of the beetles showed that all those taken carried bacilli, including *Bacillus coli communis*, *B. lactis aerogenes*, *B. faecalis alcaligenes* and in two instances, *B. pyocyaneus*.

No beetles were found in a well with a narrow shaft and stone walls, and to protect wells from infestation, it is suggested that round the top should be built a stone or wooden border with a lid having an opening screened with wire. This would also prevent mosquitos from ovipositing on the water.

BABIĆ (I.). **Parasitische Acarina und Insecta festgestellt bei Haustieren in Jugoslawien.** [Parasitic Acarina and Insecta found on domestic Animals in Jugoslavia.] [*In Serbian.*]—*Vet. Arhiv* **4** nos. 4–5 pp. 190–192, 193–195, 12 refs. Zagreb, 1934.

This is a preliminary list, arranged by hosts, of insects, mites and ticks observed in Jugoslavia attacking domestic animals and birds.

[OLENEV (N. O.).] **Оленев (Н. О.). Sur les tiques de pâturage (Ixodoidea) du nordouest de l'URSS.** [*In Russian.*]—*C. R. Acad. Sci. URSS* **3** no. 8–9 pp. 672–674, 2 refs. Leningrad, 1934. (With a Summary in French.)

A list is given of ticks recorded from north-western Russia. In 1933, it was found that besides *Ixodes ricinus*, L., which transmits *Piroplasma* (*Babesiella*) *bovis*, *I. persulcatus*, P. Sch., is also common on cattle. It is probable that it does not transmit bovine piroplasmosis and that it occurs alone in the south-eastern part of the Leningrad Government, where the disease is absent. Both species are found in north-western European Russia, but *I. ricinus* occurs alone in countries to the west of this zone and *I. persulcatus* in the forest belt stretching to the east through Siberia to the Russian Far East.

[SERGIEV (P. G.).] **Сергиев (П. Г.). Sur l'importance épidémiologique de la destruction des moustiques dans l'habitation.** [*In Russian.*]—*Med. Parasitol.* **3** no. 4 pp. 315–322, 10 refs. Moscow, 1934. (With a Summary in French.)

The author considers that Anophelines in houses should be destroyed in the spring and summer rather than in winter, since most of them hibernate elsewhere. Moreover, malaria sporozoites are rapidly killed at temperatures near freezing point and do not survive the winter in mosquitos that have become infected in autumn. On resuming activity in the spring, the surviving mosquitos, including those from unknown or remote hibernation quarters, concentrate in inhabited houses, stables and cattle sheds, and should be destroyed from this time onward, but particularly in July, August and September when the rate of infection in them reaches its maximum. In the central part of the northern Caucasus in August 1933 and in Daghestan in August and September 1932, the infection index of mosquitos in houses was as high as 13·5, and 11·36 and 23·58 per cent., respectively.

[PIKUL' (I. N.), SERGIEV (P. G.) & TIBURSKAYA (N. A.).] **Пикуль (И. Н.), Сергиев (П. Г.) и Тибурская (Н. А.). Un essai de prophylaxie du paludisme par la plasmocide au Daghestan, suivie par le contrôle du degré de l'infection des** *Anopheles*. [*In Russian.*]—*Med. Parasitol.* **3** no. 4 pp. 322–329, 6 graphs, 11 refs. Moscow, 1934.

In the course of investigations during 1933 in a coastal district in eastern Daghestan on the value of plasmocide in the treatment of malaria, observations were also made on its effect on the natural infection of Anophelines [*cf.* *R.A.E.*, B **22** 38]. In two villages in which infected persons were treated with plasmocide or plasmocide and quinine, the mean percentage of infected mosquitos was 10·8 and 18·5, as compared with 18·8 in a village in which quinine alone was administered to the whole population. The population, however, fluctuated throughout the tests, and treatment was not carried out regularly. An experiment with stained Anophelines showed that they can fly for over two miles with a favourable wind, so that they might migrate from one village to another and thus affect the parasite index of the local mosquitos.

[KALANDADZE (L.) & MCHELIDZE (I.).] **Каландадзе (Л.) и Мчелидзе (И.). Sur l'histoire de la répartition des** *Gambusia* **et sur ses ennemis.** [*In Russian.*]—*Med. Parasitol.* **3** no. 4 pp. 336–339, 9 refs. Moscow, 1934.

Notes are given on the history of the introduction of *Gambusia* into Europe against mosquito larvae and its establishment in the Russian Union [*R.A.E.*, B **22** 193, etc.]

[MARTZINOVSKIĬ (E. I.).] **Марциновский (Е. И.). Sur la clinique des morsures de l'araignée Kara-Kurt** (*Lathrodectes tredecimguttatus*). [*In Russian.*]—*Med. Parasitol.* **3** no. 4 pp. 342–348, 2 figs., 3 graphs, 8 refs. Moscow, 1934.

Brief notes are given from the literature on *Latrodectus* (*Lathrodectes*) *tredecimguttatus*, Rossi, and the effect of its bite on man. In the

Russian Union, this spider occurs in areas adjoining the Black, Caspian and Aral Seas, where men are sometimes killed by it, as are numbers of cattle and camels.

[Yatzenko (F. I.), Paretzkaya (M. S.) & Kiprich (S. Kh.).] **Яценко (Ф. И.), Парецкая (М. С.). и Киприч (С. Х.). Un cas de myiase de l'urèthre.** [*In Russian.*]—*Med. Parasitol.* **3** no. 4 p. 348. Moscow, 1934.

A case of urethral myiasis is recorded from eastern Ukraine in a six-years old boy, several larvae of *Musca domestica*, L., being voided at intervals in October 1929 and again in June 1930. It is probable that the eggs were laid on a dirty sheet in the bed of the child.

[Kondrat'ev (V. I.).] **Кондратьев (В. И.). Deux cas de gastrophylomyiase.** [*In Russian.*]—*Med. Parasitol.* **3** no. 4 pp. 349–350, 1 fig. Moscow, 1934.

Two instances that occurred in western Siberia in August 1931 and July 1932, respectively, are recorded of infestation of the face of man by larvae of *Gastrophilus intestinalis*, DeG. (*equi*, Cl.).

Kenya. **Notes with regard to Precautions which should be adopted by Companies or Individuals engaged in Mining or Prospecting in Malarious or Sleeping Sickness Areas.**—5 pp. Nairobi, 1934.

In Kenya the most important vector of sleeping sickness is *Glossina palpalis*, R.-D., and the measures suggested largely consist in prescribing the size of the clearings that should be made along rivers or lake shores to protect the camp, watering place or river crossing from fly. In the case of malarious areas the main recommendation is to remove or treat all stagnant water, which may act as a breeding-place for the two chief vectors, *Anopheles gambiae*, Giles (*costalis*, Theo.) and *A. funestus*, Giles, within half a mile of mills, residences or camps.

Schwetz (J.). **Synopsis de la répartition générale des diverses espèces de Glossines au Congo belge.**—*Rev. Zool. Bot. afr.* **26** fasc. 1 pp. 73–81, 14 refs. Brussels, December 1934.

The extensive literature on the distribution of the species of *Glossina* in various parts of Africa is widely scattered, and for this reason the author here summarises what is known of the distribution in the Belgian Congo of the 12 species and 3 varieties that occur there.

Lewis (E. A.). **Tsetse-flies in the Masai Reserve, Kenya Colony.**—*Bull. ent. Res.* **25** pt. 4 pp. 439–455, 1 fldg map, 8 refs. London, December 1934.

A detailed account is given of the distribution of tsetse-flies in the Masai Reserve, Kenya Colony, compiled from the author's own observations, from a small number of publications and from unpublished records. The species that have been recorded from this region are *Glossina longipennis*, Corti, *G. brevipalpis*, Newst., *G. fuscipleuris*, Aust., *G. palpalis*, R.-D., *G. pallidipes*, Aust., and *G. swynnertoni*, Aust., and thus comprise all those known from the Colony

except *G. austeni*, Newst., and *G. palpalis fuscipes*, Newst. All previous records of *G. fusca*, Wlk., from Kenya refer either to *G. fuscipleuris*, as in a case recently noticed [*R.A.E.*, B **22** 5], or to *G. brevipalpis*.

JACKSON (C. H. N.). **A Note on the Concentrations of Tsetse-flies.**—*Bull. ent. Res.* **25** pt. 4 pp. 457–458. London, December 1934.

In a paper recently noticed [*R.A.E.*, B **21** 197], it was stated that the present author had found [**22** 24] that in Western Kondoa (Tanganyika) in the dry season *Glossina morsitans*, Westw., became more numerous in the *Berlinia-Brachystegia* woodland immediately surrounding "vleis" (drainage valleys), and that owing to the small size of such vleis the fly appeared to concentrate in them. The author points out that this statement is due to a misunderstanding of his findings, since the flies really became more numerous in the vlei than in the woodland surrounding it, the daily catches in September being 25·3 in the vlei, 14·5 in the margin of the woodland and 21·1 in the woodland, and in October 20·4, 16·9 and 13·5 in the same three sites.

THEODOR (O.). **Observations on the Hibernation of** *Phlebotomus papatasii* (**Dipt.**).—*Bull. ent. Res.* **25** pt. 4 pp. 459–472, 12 refs. London, December 1934.

According to the observations of Roubaud [*R.A.E.*, B **16** 56, 171, 239] hibernation in *Phlebotomus papatasii*, Scop., is not due to external factors but to asthenobiosis occurring cyclically after a number of active generations as a consequence of an intoxication of the tissues of the larval organism by a surcharge of urates. The experiments described in the present paper were undertaken to determine whether hibernation of *P. papatasii* in Palestine is due to asthenobiosis or to other factors. The method of rearing described, which is a modification of that already noticed [**15** 100], made it possible to maintain a continuous supply of this sandfly, which is easily induced to bite in the laboratory.

The following is largely taken from the author's summary: It is possible to breed *P. papatasii* at 30°C. [86°F.] during the winter without the occurrence of hibernation, so that hibernation in Palestine is primarily caused by low temperature, although cyclical (? hereditary) factors exist that modify the phenomena to a certain extent, as is indicated by the following facts. A gradually increasing number of resting larvae occur during autumn, with a maximum of hibernating larvae in the first winter generations. At 30°C. development is increasingly prolonged during the late summer generation, the maximum duration being reached in the first winter generations. Larvae that hibernated in spite of the fact that they were kept at 30°C. pupated in spring at the same time as larvae kept under outdoor conditions during the winter. There is always a certain number of resting larvae (2–12 per cent.) throughout the summer in otherwise active broods. Thus the inclination to diapause exists in all generations; and there is evidence that diapause may also be brought about by unfavourable conditions, such as lack of food, overcrowding, etc. The interval between emergence and oviposition could not be correlated with asthenobiosis.

BUXTON (P. A.). **Further Studies upon Chemical Factors affecting the Breeding of *Anopheles* in Trinidad.**—*Bull. ent. Res.* **25** pt. 4 pp. 491–494, 1 ref. London, December 1934.

As a result of two years' work in Trinidad, M. V. F. Beattie obtained data on the physical and chemical factors affecting the breeding of *Anopheles tarsimaculatus*, Goeldi [*R.A.E.*, B **21** 54]. A table based on these data shows that larvae were only found rarely and in small numbers when the ammonia nitrogen content of the water was above 0·03 parts per 100,000, and that the number of occasions on which larvae were found and their numbers when present increased with the lowering of the concentration. Statistical analyses of the data show that the correlation coefficient, the correlation ratio and the difference between them are significant for the number of larvae and the ammonia nitrogen content, whether based on figures for two years obtained in ponds, rice-fields and canals, or for one year in rice-fields only, and for the number of larvae and the organic nitrogen content based on figures for the two years. Her conclusion that hydrogen-ion concentration, carbon dioxide, dissolved oxygen, nitrites, nitrates, phosphates, chlorides and total solids showed no correlation with the numbers of larvae have been confirmed by the author in several instances by determining the mean number of larvae found with certain concentrations of the chemical factor.

SENIOR-WHITE (R.). **Three Years Mosquito Control Work in Calcutta.**—*Bull. ent. Res.* **25** pt. 4 pp. 551–596, 1 fig., 9 graphs, 4 pp. refs. London, December 1934.

The first part of this paper deals with the mosquitos of Calcutta and the second with the bionomics of *Culex fatigans*, Wied., which is the predominant species. Routine catches were made at eleven catching stations from March 1931 to February 1934 and more than 19,000 mosquitos were taken.

The following is largely taken from the author's summary and conclusions: A total of 46 species of mosquitos including 14 species of Anophelines is now known to occur in the City of Calcutta, but about 97 per cent. of the total catch was made up of 9 species only. Notes are given on the bionomics of 44 species. *Aëdes aegypti*, L. (*Stegomyia fasciata*, F.) seems gradually to have replaced *A.* (*S.*) *albopictus*, Skuse, in Calcutta during the present century. The effects of height and of curtains and other hangings on mosquito incidence in buildings are discussed; mosquitos were more numerous where there were more hangings, and, with the exception of *A. aegypti*, decreased in numbers the higher the rooms were from the ground level.

The literature on *C. fatigans* published since 1919 is reviewed. Experiments described prove that the adults are easily transported mechanically. The flight of the males was shown to be much longer than that of the females. Activity is greatest during the first two hours of darkness. Studies on digestion and ovarian development in captured females showed that in the month when mosquitos are most annoying, females that have oviposited and are again ready to feed predominate. A minimum of 4½ days elapses between emergence and oviposition. The percentage captured in each stage of digestive-ovarian condition in an uncontrolled area appeared to follow the exponential catenary curve, only about one-eighth of the females in a house being in a

state to bite. The mosquito is active no matter what the condition of the abdomen, ingress and egress being equal. A comparison of the percentages captured in each stage in a controlled and uncontrolled area showed that the percentage of young, unfed mosquitos was higher in the uncontrolled area, since no breeding was taking place in the controlled area, whereas the percentage of newly fed mosquitos was highest in the controlled area. It was found that if there is a high percentage of unfed adults in the morning catches in a controlled area, the control work must be faulty and breeding is taking place in the vicinity, but if the percentage in this state is low, then the adults found are invaders, and the bounds of control work must be extended if their numbers are to be further reduced. There is a direct relation between the percentage of newly fed mosquitos and wet bulb temperature during the months when the species is increasing in numbers that does not hold good during months when its numbers are decreasing.

PECKOLT (W.) & PRADO (A.). **Ensaio da acção larvicida do *Enterolobium timbouva*, Mart., (Leguminosae), na prophylaxia culicidica.** [A Test of the larvicidal Action of *E. timbouva* in anti-mosquito Work.]—*Ann. paulist. Med. Cirurg.* **28** no. 3 pp. 261–263. São Paulo, September 1934. (Abstr. in *Trop. Dis. Bull.* **32** no. 2 p. 145. London, February 1935.)

The wood and bark of *Enterolobium timbouva*, a tree used as a fish-poison in Brazil, contain a saponin, which with water or alcohol, in either of which it is readily soluble, forms a sapotoxin. A table gives the results of some experiments on its use as a mosquito larvicide and shows that it is rather less effective than Paris green.

TOUMANOFF (C.). **Quelques faits sur les habitudes trophiques des anophélines d'Extrême-Orient.**—*Bull. Soc. Path. exot.* **27** no. 10 pp. 932–936, 5 refs. Paris, 1934.

A table is given showing the results of precipitin tests with 16 species of Anophelines from Cochin China, Hong Kong [*cf. R.A.E.*, B **23** 34], south Annam, central Laos and the Netherlands Indies. The author points out that while this gives a general idea of the ability of various species to feed on animals, the food preferences of Anophelines as well as their natural infection with malaria parasites should be studied in relation to local conditions. Such a study, details of which will be published later, has enabled the author to draw the following conclusions. *Anopheles minimus*, Theo., and *A. jeyporiensis*, James, the most important vectors of malaria in Indo-China and Hong Kong, which are usually found to contain human blood, have been found engorged with bovine blood, particularly in a locality (Hong Kong) where both buffalos and cattle are present and are also well stabled. On the other hand, in a locality in Cochin China where there were cattle but no buffalos, these species engorged chiefly on the blood of man and small animals, such as dogs and pigs. Only one among 126 specimens of *A. minimus* from a locality where no buffalos occurred contained bovine blood, and in that case the reaction was also positive for man. It thus appears probable that paucidentate vectors of malaria (and perhaps other paucidentate Anophelines) feed on buffalos rather than on cattle as an alternative to man. The maxillary indices of

24 individuals of *A. maculatus*, Theo., *A. kochi*, Dön., and *A. splendidus*, Koidz. (*maculipalpis*, auct.), that had fed on cattle blood ranged from 12 to 16, 21 having an index of more than 13. On the other hand, the maxillary indices of 250 examples of *A. tessellatus*, Theo., from a locality where they had fed chiefly on buffalos averaged 11·7, certain engorged individuals having indices of 9·5, 10 and 11. Thus there appears to be no doubt that buffalos may be attacked by paucidentate species. The multidentate species, which take little or no part in the transmission of malaria, were found engorged with bovine blood even in localities where cattle comprised the whole of the domestic stock.

Numerous observations have shown that of the common, non-transmitting species captured in houses the proportion engorged with human blood is relatively low. Thus out of 334 precipitin reactions with the stomach contents of *A. hyrcanus* var. *sinensis*, Wied., *A. tessellatus*, *A. subpictus*, Grassi, *A. barbirostris*, Wulp, and *A. vagus*, Dön., only 20 (5·9 per cent.) were positive for human blood ; moreover a number of the mosquitos had been taken in malarious localities where cattle are scarce and stabled poorly or not at all. Among *A. vagus* taken in houses only 9 out of 261 reactions were positive for human blood, so that it is unwise to conclude that engorged females taken in houses have necessarily fed on man. In Cochin China, the absence of good stabling for cattle does not entirely check the deviating effect of cattle on the common species, the food of which is dependent rather on a tropism than on the immediate availability of hosts. The common species do, however, feed on man in localities where cattle are scarce or absent [*cf. loc. cit.*] and may become dangerous if gametocyte carriers are present. Heavy rains and wind seem to have little influence on the movements of the common species in southern Indo-China, since females engorged with animal blood have been taken in the middle of the rainy season in places where cattle were not stabled. Thus in the absence of prolonged frost the presence of Anophelines in houses in this region does not necessarily mean their protracted contact with man.

TREILLARD (M.). **Destruction saisonnière domestique des anophèles adultes (*H. minima*) pour la prophylaxie antipaludique en Indochine méridionale.**—*Bull. Soc. Path. exot.* **27** no. 10 pp. 937–939. Paris, 1934.

Owing to the diversity of the breeding-places of *Anopheles* (*Myzomyia*) *minimus*, Theo., and their wide and irregular distribution, anti-larval measures are liable to prove unsatisfactory, particularly in places where extensive programmes for regional control cannot be carried out. The author therefore recommends the systematic fumigation of houses with cresyl for the destruction of the adult mosquitos for several weeks before and after the end of the rainy season, a period when the numbers of both adults and larvae are at their lowest. The method of evaporating cresyl on the hearth is expensive and is not regarded as satisfactory, particularly as it is almost impossible to seal up such dwellings as the huts of plantation coolies and a large amount of time is required. The author recommends an apparatus in which the cresyl falls drop by drop from a small reservoir on to a plate heated by a lamp, and so is vaporised almost immediately. A blower fixed to the same support as the lamp, plate and reservoir

enables the cloud of vapour to be directed against the mosquitos sheltering under beds, in clothing, behind piles of wood, etc. At the time recommended, the adults are almost immobile.

LEGENDRE (F.). **Note sur une tournée de prospection antipalustre à Ambatondrazaka et dans la région du lac Alaotra.**—*Bull. Soc. Path. exot.* **27** no. 10 pp. 957–960. Paris, 1934.

From 3rd to 9th May 1934, malaria and mosquito surveys were made at Ambatondrazaka, in the region of Lake Alaotra, which is one of the most important agricultural districts of Madagascar. Malaria parasites were found in 22 out of 206 blood slides examined. In the most infested quarter of the town as many as 86 examples of *Anopheles gambiae*, Giles (*costalis*, Theo.), were taken in 7 houses. In the centre of the town, small numbers of *A. pharoensis*, Theo., and *A. coustani*, Lav. (*mauritianus*, Grp.), were also collected. The town is on the leeward side of a large area of marsh, in which are rice-fields and which is impossible to drain for financial reasons; Anopheline larvae were numerous in the marsh. About 12½ miles away is an agricultural school situated on a small hill surrounded by rice-fields and by marshes of which some extend to the Lake 3–4 miles away. Malaria parasites were found in 4 out of 61 slides examined. Reservoirs for the rearing of *Gambusia* [*cf. R.A.E.*, B **22** 111] were established in the town and at the agricultural school, and additional ones are to be established round the Lake, etc. A small larvivorous fish found in a river near Andreba, although less effective than *Gambusia*, might also be used in the High Plateaux region.

REES (D. M.). **Mosquito Records from Utah.**—*Pan.-Pacif. Ent.* **10** no. 4 pp. 161–165. San Francisco, Calif., October 1934.

This annotated list of the mosquitos recorded from Utah comprises the more common species, among which the only Anopheline is *Anopheles maculipennis*, Mg.

PRIDIE (E. D.). **Résultats des récentes recherches sur la fièvre jaune au Soudan anglo-égyptien.**—*Bull. Off. int. Hyg. publ.* **26** no. 12 pp. 2103–2105, 1 ref. Paris, December 1934.

The yellow fever protection test recently applied to sera collected in southern and western Sudan [*cf. R.A.E.*, B **22** 176] gave positive results with the sera of adults from several localities in the Provinces of Darfur, Kordofan, Mongalla and Bahr-el-Ghazal, but positive results with the sera of children under 12 years of age were only obtained in 3 localities in Bahr-el-Ghazal, in one of which the first case of yellow fever to be observed in the Sudan was recently diagnosed. The geographical distribution of the reacting individuals was such as would be expected if the infection had been introduced into Sudan from the west. The positive results obtained from places situated on or near the main pilgrim routes from West Africa proved the existence of yellow fever in these localities in the past and the same is true of other places that were at one time in communication with West Africa. The restrictions imposed on aeroplane traffic as a result of these findings are briefly enumerated.

Sinton (J. A.) & Shortt (H. E.). **Cutaneous Leishmaniasis as a Natural Infection of a Dog in India.**—*Indian J. med. Res.* **22** no. 2 pp. 393–396, 4 refs. Calcutta, October 1934.

The authors record the finding of *Leishmania* in cutaneous lesions on the nose and upper lip of a dog in the Punjab. When *L. donovani* is injected into dogs, the lesions produced are sometimes cutaneous in character, and it is therefore possible that the lesions under consideration were caused either by this parasite or by *L. tropica*. The dog, which was 3 years old, was born and had spent most of its life at Kasauli (6,000 ft. above sea level), where no local cases of leishmaniasis, either cutaneous or visceral, have been recorded. Moreover, neither of the suspected vectors of cutaneous leishmaniasis, *Phlebotomus papatasii*, Scop., and *P. sergenti*, Parrot, occurs at Kasauli, and another dog living in the same house has shown no lesions. In December 1933, the dog was taken to Karnal in the plains where it remained until May 1934, when it was taken back to Kasauli. The lesions were first observed on 16th July. At Karnal local cases of cutaneous leishmaniasis in man are not uncommon, and *P. papatasii* and *P. sergenti* occur in close proximity to the place where the animal slept; another dog that was living under the same conditions but did not remain long on the plains during the sandfly season has shown no signs of infection.

Risquez (J. R.). **Tripanosomosis de los reduvideos de Venezuela.** [Infection of Reduviid Bugs by Trypanosomes in Venezuela.]—*Gac. méd. Caracas* **41** no. 7 pp. 97–100, 20 refs. Caracas, 15th April 1934. (Abstr. in *Trop. Dis. Bull.* **32** no. 1 p. 38. London, January 1935.)

Forms of *Trypanosoma cruzi* were found in *Triatoma dimidiata*, Latr., *T. infestans*, Klug, *T. protracta*, Uhler, *T. rubrofasciata*, DeG., *T. sanguisuga*, Lec., *T. vitticeps*, Stål, *Panstrongylus* (*T.*) *geniculatus*, Latr., *Eutriatoma* (*T.*) *sordida*, Stål, *Rhodnius prolixus*, Stål, and *Eratyrus cuspidatus*, Stål, from Venezuela.

Daubney (R.), Hudson (J. R.) & Roberts (J. I.). **Preliminary Note on the Transmission of Bovine Haemorrhagic Septicaemia by the Flea** *Ctenocephalus felis* **Bouché.**—*J. comp. Path.* **47** pt. 3 pp. 211–213. Croydon, September 1934.

During routine investigations of two recent outbreaks of haemorrhagic septicaemia in cattle in Kenya, it was noticed that the younger cattle, particularly the unweaned calves, were heavily infested with *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch. Moreover, the mortality was highest among the unweaned calves, which were housed in rough wood and grass buildings with red earth floors harbouring large numbers of the same species of flea. About 200 fleas from each of 13 apparently healthy calves were allowed to feed on white mice. These were unsatisfactory as experimental animals since they defended themselves against the attacks of fleas, and although some of the latter succeeded in obtaining a meal, they rarely managed to engorge completely. One mouse died 4 days after infestation and *post-mortem* findings, sub-inoculations and cultures indicated that death was due to infection

with *Pasteurella boviseptica*. Fleas from a calf proved to have died of the disease were allowed to feed on 8 mice, and one of these died on the fourth day, the findings being similar to those in the case of the first mouse. Since the two mice had eaten all the fleas except 5 the mode of transmission was not elucidated. Although it is not suggested that haemorrhagic septicaemia is always transmitted by fleas, the part they may play in infecting calves in tropical countries should not be overlooked.

[Ioff (I. G.) & Skorodumov (A. M.).] **Иофф (И. Г.) и Скородумов (А. М.). Contribution to the Study of the Fauna of Fleas in the Transbaikal endemic Focus of Plague.** [*In Russian.*]—*Sborn. Rab. protivochumn. Org. Vostochnosibirsk. Kraya za 1929–1931 g.* in *Izv. Vostochnosib. kraev. Inst. Microb. Epid. v Irkutske* **1** pp. 88–108, 70 refs. Moscow, OGIZ, 1933. [Recd. January 1935.]

A detailed account is given of investigations in 1927–30 on fleas occurring on man and animals (chiefly rodents) in a locality in the eastern part of the Transbaikal region where plague is endemic. Over 2,000 fleas were collected, comprising 13 genera and 21 species, of which 6 will probably prove to be new. The hosts and the fleas are listed, the latter including 15 additional species that have been recorded from Transbaikalia by other investigators and 2 that have not been observed there but almost undoubtedly occur. A table shows the distribution of the different fleas among their hosts, which hosts are usually or accidentally infested, and the numbers and dates of capture of the fleas. The individual fleas are then discussed separately under their hosts, details being given of the numbers captured with brief notes on the bionomics of the fleas and the habits of the hosts.

[Tikhomirova (M. M.).] **Тихомирова (М. М.).** *Meriones meridianus* **Pall., a Reservoir of Plague Virus in sandy Regions of the Volga-Ural Steppes.** [*In Russian.*]—*Rev. Microbiol.* **13** no. 2 pp. 89–102, 10 refs. Saratov, 1934. (With a Summary in English.)

During investigations on plague carried out from October 1926 to the end of 1933 in the sandy region in western Kazakstan between the Lower Volga and the river Ural, living and dead examples of *Meriones meridianus* were found infected. Observations were therefore carried out on the biology of this rodent, which suffers from epizootics in autumn and winter, when epidemics of plague occur in man. An account of its habits is given. In the region of the Volga-Ural sands, where it constitutes about 50 per cent. of all the rodents, it comes into close contact with man at the time of harvest of certain wild cereals, the seeds of which it stores for the winter [*cf. R.A.E.*, B **18** 26]. Thus the transmission of plague from it is possible either through its fleas or its excreta.

Only a very few fleas were found on *M. meridianus* or in its nests; the species were *Ceratophyllus mokrzeckyi*, Wagn., *C. laeviceps*, Wagn., and *Xenopsylla conformis*, Wagn., on the animals, and *Neopsylla setosa*, Wagn., *C. tesquorum*, Wagn., *Ctenophthalmus* sp., and *Mesopsylla*

sp. in the nests. Plague bacilli were isolated from two examples of *C. mokrzeckyi* taken on *M. meridianus*, and this flea and *Pulex irritans*, L., were found on men harvesting wild cereals. *Pulex irritans* and some fleas of other rodents attacked *M. meridianus* in the laboratory.

In experiments in the laboratory carried out at intervals over a period of 6 years, *M. meridianus* was artificially infected with plague by different methods, which are described. In the whole of the experiments, less than 50 per cent. of these rodents contracted infection, and many recovered in a few days. Some apparently harboured the disease in a latent form for periods of from 16 days to a year. The highest percentage (77) of positive results was obtained by feeding them on the organs of plague-infected rodents. *Bacillus pestis* was constantly present in the excreta of individuals infected in this way. From this work it is concluded that *M. meridianus* is the chief reservoir of plague in the sandy region of western Kazakstan, that it contracts infection in nature chiefly by feeding on the dead bodies of rodents, and that other rodents and possibly man may be infected by means of its excreta.

[Vol'fertz (A. A.), Kolpakova (S. A.) & Flegontova (A. A.).] **Вольферц (А. А.), Колпакова (С. А.) и Флегонтова (А. А.). On the Epizoology of Tularaemia. I. The Rôle of Ectoparasites in the tularaemic Epizootic of Ground Squirrels.** [*In Russian.*]—*Rev. Microbiol.* **13** no. 2 pp. 103–118, 5 graphs, 25 refs. Saratov, 1934. (With a Summary in English.)

A detailed account is given of investigations carried out from about the end of April to mid-July 1934 in the Stalingrad district of the Lower Volga region on the causes of an epizootic of tularaemia among ground squirrels (*Citellus pygmaeus*) that occurred there in April. In the autumn of 1933 the district had been invaded by great numbers of Murid rodents; as many as 4,000 of their holes were sometimes found per acre, while 200–300 mice (*Mus musculus*) were trapped in a night in some of the houses in September and October. A severe epizootic spread among the field Murids from September onwards, as a result of which, together with unfavourable winter weather, they had disappeared completely by the following spring. It was found that their burrows surrounded those of the ground squirrels and in many instances were in close contact with them. Of 1,435 fleas collected from six species of rodents or their nests, *Ctenophthalmus pollex*, Wagn. & Ioff, *C. orientalis*, Wagn., and *Ceratophyllus tesquorum*, Wagn., were the most numerous, being common to *C. pygmaeus*, *Microtus arvalis*, *Lagurus lagurus* and the water rat, *Arvicola amphibius*. In the literature, the two species of *Ctenophthalmus* have also been recorded from *Mus musculus* and other rodents. In the spring of 1934 examination of empty nests of *M. arvalis* and *L. lagurus* that had died of the epizootic showed that these two fleas had survived the winter in them and may thus eventually pass to young ground squirrels that enter the abandoned burrows. Gamasid mites were also found in the burrows of a number of rodents.

Tularaemia was produced in ground squirrels and guineapigs by injecting suspensions of overwintered examples of these Gamasids or of *C. pollex* taken in empty nests of Murids. Suspensions of *Ceratophyllus tesquorum* and *Neopsylla setosa*, Wagn., failed to produce the

disease, and a test with *Ctenophthalmus orientalis* was inconclusive, since the animal developed a disease characteristic of tularaemia caused by an attenuated virus.

[Zasukhin (D. N.) & Kolpakova (S. A.).] **Засухин (Д. Н.) и Колпакова (С. А.). Ueber Ermittelungsmethoden der Ektoparasiten.** [On the Methods of estimating Ectoparasites. (*In Russian.*)]—*Rev. Microbiol.* **13** no. 2 pp. 129–135, 13 refs. Saratov, 1934. (With a Summary in German.)

In view of the need for standardising methods of registering the incidence of ectoparasites of domestic and wild animals [*cf. R.A.E.*, B **20** 140], suggestions are made for a scheme by means of which the "ectoparasitic index" of animals and of their habitats may be represented by formulae. Of these, some would indicate the qualitative and quantitative relation of the complex of ectoparasites grouped under their orders and families, and others would show this relation for individual species of each group. Examples are given of the application of formulae for representing the numbers and species of Arthropods taken in nests of rodents in western Kazakstan. It is important to form correct estimates of the numbers of ticks infesting pasture land and wild animals occurring there, in order to be able to determine which control measures may be the most effective and whether cattle should be dipped or sprayed. In the case of ticks that attack domestic animals as adults, and small rodents as larvae and nymphs, their prevalence and species could be determined by capturing and examining all the wild mammals occurring in a defined area.

[Ruibinskiĭ (S. V.) & Levit (M. S.).] **Рыбинский (С. В.) и Левит (М. С.). Die Fischzucht als Bekämpfungsmittel der Malaria in der Ukraine.** [Fish-breeding as a Method of controlling Malaria in the Ukraine.] [*In Russian.*]—*Rev. Microbiol.* **13** no. 2 pp. 151–159, 27 refs. Saratov, 1934. (With a Summary in German.)

In the Ukraine, most of the endemic centres of malaria occur in districts with vast expanses of water resulting from river floods. Neglected mill-ponds also offer favourable breeding-places for mosquitos, of which *Anopheles maculipennis*, Mg., is the chief vector of the disease. As it is planned to use large accumulations of water for breeding fish, investigations were carried out in 1932 on the possibility of rendering the fish-ponds unsuitable for mosquito larvae or using the fish against them. For this purpose, over 50 carp-ponds were examined near Kiev. Measures suggested to prevent the breeding of Anophelines include the removal from the water of vegetation, thus depriving the larvae of shelter from the fish, the improvement of the channels by which the ponds are filled or drained and in which Anopheline larvae are often numerous, dusting with Paris green, which, unlike oil, does not affect the fish, and stocking the ponds with young carp, which feed readily on the larvae. The value of other fish in this respect is discussed, and the introduction of *Gambusia* is particularly advocated, as experiments have shown that it can be established in the Ukraine [*R.A.E.*, B **22** 20]. When a pond is constructed, the bottom should be made very smooth so that it can be thoroughly dried when the pond is drained.

[ALUIMOV (A. Ya.).] **Алымов (А. Я.). Pappataci Fieber in Teheran.** [Sandfly Fever in Teheran.] [*In Russian.*]—*Rev. Microbiol.* **13** no. 2 pp. 161–164. Saratov, 1934. (With a Summary in German.)

Investigations on sandfly fever carried out in 1930–32 in Teheran, where it is common, showed that it occurs from the second half of May till early October, and is most prevalent in July and August. Its seasonal occurrence coincides with that of sandflies [*Phlebotomus*], which usually disappear in the open at the end of September, but are sometimes found in houses as late as November. The hot dry weather prevailing in Teheran, which is situated at an altitude of about 4,000 ft., is very favourable to their development; none was found at a much higher altitude in a summer resort about 10 miles from the town.

[ZASUKHIN (D. N.).] **Засухин (Д. Н.). Biological Method of Tick Control.** [*In Russian.*]—*Rev. Microbiol.* **13** no. 2 pp. 169–171, 21 refs. Saratov, 1934.

The utilisation of parasites for the control of ticks, especially *Dermacentor venustus*, Banks (*andersoni*, Stiles), is reviewed [*cf. R.A.E.*, B **19** 137, 138; **22** 71, etc.], and it is recommended that similar work should be undertaken in the Russian Union against other species of *Dermacentor*.

PAPERS NOTICED BY TITLE ONLY.

TOWNSEND (C. H. T.). **A new Genus of Cobboldiini and a new Genus of Chrysomyine Flies (Dipt.: Oestridae, Muscoidea)** [*Platycobboldia*, gen. n., for *Cobboldia loxodontis*, Brauer, and *Pycnosomops*, gen. n., for *Chrysomyia putoria*, Wied., and *C. rufifacies*, Macq.].—*Ent. News* **45** no. 10 p. 277. Philadelphia, Pa, December 1934.

PATTON (W. S.) & GIBBINS (E. G.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Genera of the Tribe Muscini, Subfamily Muscinae, based on a Comparative Study of the Male Terminalia. III.—The Metallic Muscini** [short description of the male terminalia of a typical species of each of the Genera *Cryptolucilia*, *Dasyphora* and *Pyrellia*].—*Ann. trop. Med. Parasit.* **28** no. 4 pp. 571–578, 6 figs. Liverpool, December 1934. [*cf. R.A.E.*, B **21** 144; **22** 56.]

DUDLEY (S. F.). **Can Yellow Fever spread into Asia? An Essay on the Ecology of Mosquito-borne Disease.**—*J. R. nav. med. Serv.* **21** no. 1 pp. 16–28, 18 refs. London, January 1935. [See *R.A.E.*, B **22** 230.]

MOUCHET (R.) & others. **Enquête sur l'endémicité amarile au Congo belge en 1932–1933.**—*Bull. Off. int. Hyg. publ.* **26** no. 12 pp. 2123–2135, 1 fldg map. Paris, December 1934. [*Cf. R.A.E.*, B **22** 175; **23** 38.]

GALLIARD (H.) & SAUTET (J.). **Quelques caractères morphologiques** [of the larva and genital armature] **d'***Anopheles elutus* [*sacharovi*, Favr] **de Corse.**—*Ann. Parasit. hum. comp.* **13** no. 1 pp. 1–4, 2 figs., 7 refs. Paris, 1st January 1935.

BRUG (S. L.). **Notes on Dutch East Indian Mosquitos** [including 12 new species and 2 new varieties of Culicines].—*Bull. ent. Res.* **25** pt. 4 pp. 501–519, 13 figs. London, December 1934.

CHAVES FERREIRA (J.). **Observações sobre os esporozoitos do** *Plasmodium praecox* (*relictum*). [Observations on the Sporozoites of *P. praecox*.]—*Riv. Malariol.* **13** fasc. 5 pp. 559–562, 1 pl., 2 refs. Rome, 1934. (With a Summary in Italian.)

[MARTZINOVSKIĬ (E. I.).] **Марциновский (Е. И.). Ueber den Typus des Mückennetzes.** [A Design for a Mosquito Net.] [*In Russian.*] —*Med. Parasitol.* **3** no. 4 pp. 313–314, 3 figs. Moscow, 1934. [*Cf. R.A.E.*, B **22** 15].

[SMIRNOV (E. S.)]. **Смирнов (Е. С.). Recherches sur l'écologie de la** *Mormoniella vitripennis* **parasite des mouches synanthropes.** [*In Russian.*]—*Med. Parasitol.* **3** no. 4 pp. 330–336, 2 figs., 2 graphs, 8 refs. Moscow, 1934. [*Cf. R.A.E.*, B **22** 166, 216, 256.]

TEODORO (G.). **Gli acari quali trasmettitori di malattie all'uomo ed agli animali domestici.** [Mites that transmit Diseases to Man and Domestic Animals (a review of recent literature).]—*Riv. Biol.* **17** no. 1 pp. 100–108, 42 refs. Florence, 1934.

RADFORD (C. D.). **Notes on Mites of the Genus** *Myobia.*—*Northw. Nat.* **9** no. 4 pp. 356–364, 29 figs., 4 refs. Arbroath, December 1934.

COLLART (A.). **A propos d'un Acarien,** *Microlichus uncus* **Vitzthum, parasite de l'***Ornithomyia fringillina* **Curtis, (Dipt. : Hippoboscidae)** [on swallows from Belgium].—*Bull. Mus. Hist. nat. Belg.* **10** no. 1 pp. 1–6, 1 fig., 6 refs. Brussels, January 1934.

VITZTHUM (H.). *Microlichus uncus* **n. sp.**—*Bull. Mus. Hist. nat. Belg.* **10** no. 12 pp. 1–20, 6 figs. Brussels, March 1934.

IOFF (I.) & TIFLOW (W.). **Zur Kenntnis der Flöhe Russlands, insbesondere der Gattungen** *Stenoponia* **J. et R.,** *Coptopsylla* **J. et R. und** *Chaetopsylla* **Koh.** [On the Fleas of Russia, especially the Genera *Stenoponia*, *Coptopsylla* and *Chaetopsylla* (including names of hosts, 6 new species of *Stenoponia* and 3 new subspecies of *Coptopsylla lamellifer*, Wagn.)]—*Z. Parasitenk.* **7** no. 3 pp. 362–391, 33 figs., 22 refs. Berlin, 19th December 1934. [*Cf. R.A.E.*, B **22** 96, 143.]

THOMPSON (G. B.). **Records of Siphunculata and Mallophaga from Canadian Hosts.**—*Canad. Ent.* **66** no. 12 pp. 279–281. Orillia, December 1934.

ROBERTS (F. H. S.). **The Parasites of Poultry** [in Queensland ; popular account].—*Qd agric. J.* **42** pt. 5 pp. 561–572, 10 figs. Brisbane, 1st November 1934.

ROBERTS (F. H. S.). **Parasites of Cattle** [in Australia ; popular account].—*Qd agric. J.* **42** pt. 6 pp. 674–689, 13 figs. Brisbane, 1st December 1934.

MERRILL (M. H.) & TEN BROECK (C.). **Multiplication of Equine Encephalomyelitis Virus in Mosquitoes.**—*Proc. Soc. exp. Biol. Med.* **32** no. 3 pp. 421–423, 4 refs. New York, December 1934.

Investigating further the transmission of equine encephalomyelitis by mosquitos [*R.A.E.*, B **22** 225] and using a modification of a method employed by other workers [**18** 147], the authors carried out experiments to determine whether the virus could be maintained by serial passage in mosquitos. It was found that the virus passed in series through 10 lots of *Aëdes aegypti*, L., with a dilution at each transfer of at least 1 : 100, was infective. No difference was observable between the passage virus and the original strain. The virus appeared to be generally distributed in the body of the mosquitos.

DUNN (L. H.). **Entomological Investigations in the Chiriqui Region of Panama.**—*Psyche* **41** no. 3 pp. 166–183, 2 refs. Cambridge, Mass., September 1934.

An annotated list is given of blood-sucking and other Arthropods affecting man and animals in the south-western part of the Republic of Panama, based on observations and collections made in the course of expeditions in July 1929, February 1930 and August 1931.

BOYD (A. W.). **A Fly parasitic on the Swallow.**—*Brit. Birds* **28** no. 8 p. 225. London, 1st January 1935.

Larvae of *Protocalliphora coerulea*, R.-D., infesting young swallows are recorded from widely separated localities in England and Wales. It is suggested that the small broods often reported may be due to the nestlings being killed by this fly.

JELLISON (W. L.) & PHILIP (C. B.). **The Biology of the Black Widow Spider, *Latrodectus mactans*.**—*Science* **81** no. 2090 pp. 71–72. New York, 18th January 1935.

Latrodectus mactans, L., which was collected in numbers by the authors in Montana in 1932–34, occurred most frequently in the burrows of *Citellus columbianus* and probably hibernated in them. During the spring and summer the spiders were found in webs at the openings of the tunnels. They were also found in abundance in the openings of abandoned warrens of cottontail rabbits in semi-arid areas of the Yakima Valley, Washington. It would thus appear that rodent burrows form an important natural habitat for the breeding and hibernation of this spider in the north-western States.

URIARTE (L.) & others. **Pulgas y peste.** [Fleas and Plague.]—*Rev. Inst. bact.* **6** no. 2 pp. 57–98, 2 figs., 14 pls. Buenos Aires, 1934. (With Summaries in French, English & German.) [Recd. January 1935.]

Of 30,389 rats examined in Buenos Aires between 1927 and 1932 only 722 (2·37 per cent.) had fleas, giving the low flea index of 0·04. The total number of fleas taken was 1,493, of which 916 were *Xenopsylla cheopis*, Roths., 471 *Ceratophyllus fasciatus*, Bosc, 86 *Leptopsylla segnis*, Schönh. (*musculi*, Dugès), 10 *Ctenocephalides felis*, Bch.,

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4 *Ceratophyllus londiniensis*, Roths., 3 *Pulex irritans*, L., and 3 *Craneopsylla wolffhuegeli*, Roths. *X. cheopis* had also been the prevalent species in a previous survey [*R.A.E.*, B **13** 71]. *Craneopsylla wolffhuegeli*, which does not appear to have been found previously on rats in Buenos Aires, is thought to be a parasite of field rodents or small carnivora. One example of *X. cheopis* was taken from a wild host, *Lutreolina crassicaudata*, and two mites ordinarily found on domestic rats were taken on a wild rodent. This indicates that there is an exchange of parasites between wild rodents and domestic rats when the latter migrate to the fields. Tables show the results of examinations of rats and observations on temperature and humidity from 1928–33. Plague was found in a few of the rats in each year except 1932, the highest percentage of infection being 0·26, in 1928. Rothschild's key to the genus *Craneopsylla* and his description of *C.* (*Stephanocircus*) *wolffhuegli* are appended.

Savino (E.). **Tres brotes pestosos en las provincias de Salta, Jujuy y San Luis.** [Three Appearances of Plague in the Provinces of Salta, Jujuy and San Luis.]—*Rev. Inst. bact.* **6** no. 2 pp. 99–129, 19 figs., 4 maps. Buenos Aires, 1934. (With Summaries in French, English & German.) [Recd. January 1935.]

This is a report on cases of plague in man observed in Argentina between November 1932 and April 1933. In the province of Salta *Mus* (*Rattus*) *rattus* and *M.* (*R.*) *norvegicus* were numerous in the huts, the inhabitants were commonly infested with fleas, and a rat that had been poisoned was found to be infected with *Bacillus pestis*. Four examples of *M. rattus* captured in the town of Jujuy harboured 23 females and 13 males of *Xenopsylla cheopis*, Roths., 3 females of *Leptopsylla segnis*, Schönh. (*musculi*, Dug.), and 1 female of *Ceratophyllus fasciatus*, Bosc. In San Luis the outbreak occurred in a village where there was an epizootic among rats (*M. norvegicus*) in a grain store.

Ferrière (C.). **Note sur les parasites de** *Lyperosia exigua* **de Meij.**—*Rev. suisse Zool.* **40** no. 34 pp. 637–643, 2 figs. Geneva, December 1933. [Recd. January 1935.]

Handschin (E.). **Notizen über die Biologie der von Dr. Ferrière bestimmten** *Lyperosia*-**Parasiten.** [Notes on the Biology of the Parasites of *Lyperosia* determined by Dr. Ferrière.]—*T.c.* pp. 643–644.

Of the parasites of *Lyperosia exigua*, de Meij., dealt with in the first paper, those recorded from Java are the Encyrtids, *Tachinaephagus giraulti*, Johnston & Tiegs., which was also bred from *Musca*, etc., this being the first record outside Australia, and *Cerchysius lyperosiae*, sp. n., and the Pteromalid, *Pachycrepoideus dubius*, Girault. In commenting on the systematic position of *Spalangia orientalis*, Graham, and *S. sundaica*, Graham [*cf. R.A.E.*, B **20** 258], the author states that *S. cameroni*, Perkins, occurs in Hawaii and Fiji and is a parasite of *L. exigua* in the Solomon Islands. The Eulophid, *Trichospilus pupivora*, Ferrière, was obtained in Java, probably from the pupa of a Tachinid. A Diapriid, *Phaenopria fimicola*, sp. n., is described from Australia, "taken from dung containing larvae."

In the second paper it is stated that *Spalangia* spp. are far more important parasites of *Lyperosia* than any of the other species.

ENDERLEIN (G.). **Aussereuropäische Simuliiden aus dem Wiener Museum.** [Extra-European Simuliids from the Vienna Museum.] —*S.B. Ges. naturf. Fr. Berl.* **1934** no. 4–7 pp. 190–195. Berlin, 1934.

Descriptions are given of 2 new genera and 6 new species of Simuliids from Mexico, India and South America, with a note that the female of *Psaroniocompsa opalinifrons*, gen. et sp. n., attacks man in Paraguay.

RASTÉGAIEFF (A. F.). **Un nouveau vecteur dans la transmission des hémoparasites des animaux domestiques :** *Ornithodorus lahorensis*, **Neumann, 1908.**—*Ann. Inst. Pasteur* **54** no. 2 pp. 250–258, 10 refs. Paris, February 1935.

In Azerbaijan, sheep are infested by ticks, which appear while the flocks are in the folds in winter and disappear when they are sent to pasture in the mountains. The ticks are found in cracks in the wooden walls and floors of the sheep shelters, and they apparently transmit a disease that is often fatal. This disease is reported to be absent for two years from newly constructed shelters, but mortality occurs in the third year. Nymphs and adults, which were identified in Leningrad as *Ornithodorus lahorensis*, Neum., were allowed to engorge on a healthy kid, which died some weeks later after *Anaplasma ovis* and *Theileria* sp. had been found in its blood.

GILMOUR (C. C. B.). **Bubonic Plague, Rats and Fleas in Singapore.**—*Malay. med. J.* **9** no. 4 pp. 176–181, 3 figs. Singapore, December 1934.

The history of bubonic plague in Singapore from the time of its introduction in 1900 until 1933 is reviewed from the annual reports of the Municipal Health Officer. The incidence of the disease has been so low that although the rate of mortality has been high it has not appreciably affected the death rate. Plague has existed in the rat population for at least 30 years. *Mus* (*Rattus*) *norvegicus* (*decumanus*) is the most numerous species of rat in the town, but *M.* (*R.*) *rattus* predominates among rats sent in from ships, and from the port and rural areas. *M. rattus* is a climbing rat and is found in the upper rooms of houses living in association with man, whereas *M. norvegicus* burrows and lives underground, and it is suggested that the low incidence of plague may be explained by the preponderance of the latter, since in this part of the world it is the custom to sleep on the upper floors, and fleas from infected examples of *M. norvegicus* would have difficulty in reaching man or even *M. rattus*.

The flea index is low, particularly so during recent years. *Xenopsylla cheopis*, Roths., is the most numerous flea ; and as it is found in much larger numbers on *M. rattus*, it is suggested that the microclimate of the holes and nests inhabited by this rat is more favourable than that in the burrows and drains occupied by *M. norvegicus*, or that the fleas are more exposed to natural enemies in the habitat of the latter. As a result of a laboratory experiment, it is suggested that ants may be of importance in controlling fleas. The flea population varies considerably in different parts of the town, probably because of unknown local conditions.

STRUTHERS (E. A.) & SINHA (S. N.). **The Use of Bamboo in Subsoil Drainage. Review of Three Years Experiment.**—*Malay. med. J.* **9** no. 4 pp. 197–199, 4 refs. Singapore, December 1934.

Experiments on the use of bamboo pipes as a means of subsoil drainage for Anopheline control have been in progress in Malaya for more than 3 years [*cf. R.A.E.*, B **21** 254], and two species of bamboo have been found to last at least that length of time. It has been found that pipes not less than 3 ins. in diameter should be laid at a depth of 5 ft. to avoid so far as possible the danger of choking. The procedure of laying the pipes and constructing inspection pits and the use of sheet iron inverts are described. The cost of laying and maintaining the pipes is given for each ravine and compared with the cost of oiling. The method is cheaper than oiling, and supervision and maintenance are easier. It cannot be regarded as a substitute for permanent drainage by means of tile pipes and is not worth considering where bamboo is not easily available, but it would be of use in isolated situations where the cost of transport of oil is high, where constant supervision of oiling is impossible, and where the temporary nature of the occupation does not justify the high capital cost of drainage by tile pipes.

TAYLOR (E. L.). **An Attempt to transmit Anaplasmosis by British Biting Flies.**—*Vet. J.* **91** no. 1 pp. 4–11, 1 ref. London, January 1935.

As American workers have recorded transmission of anaplasmosis (apparently mechanically) from infected to healthy cattle by means of blood-sucking flies [*R.A.E.*, B **20** 205; **21** 224], investigations were undertaken in England where carriers of the disease are often kept for the purpose of immunising cattle for export to countries in which it is endemic. One healthy animal was subjected to 46 bites by *Haematopota pluvialis*, L., and another to more than 6,000 bites by *Stomoxys calcitrans*, L., as soon as the flies had partly engorged on an infected animal, but no symptoms of disease were observed although the animals were later proved to be susceptible. On account of the small number of trials no claim is made to have proved that the disease cannot be transmitted by biting flies in England, but the negative results strongly suggest that such transmission is unlikely under natural conditions.

MACLEOD (J.). **The Part played by Alternative Hosts in maintaining the Tick Population of Hill Pastures.**—*J. Anim. Ecol.* **3** no. 2 pp. 161–164, 1 graph, 2 refs. Cambridge, November 1934.

Ixodes ricinus, L., is known to feed on a large number of animals and birds [*R.A.E.*, B **20** 274; **22** 185], and an experiment was carried out in Scotland to determine to what extent, if any, it can maintain itself in the absence of sheep. A 10-acre plot of typical hill pasture infested with ticks was fenced off in May 1929, and an outer fence of game-proof wire netting was erected 45 yards from the first one to provide a " neutral area " and so prevent unfed ticks crawling in from the surrounding pasture. The original tick population was reduced by liberating in the central area 21 dipped sheep, which were dipped again at intervals of 5 days for several weeks and then removed.

In the autumn of the same year 42 sheep were placed in the central area and dipped every 3 days for 6 successive dippings, and in the autumn of 1930, 26 sheep were pastured there and dipped every 3 days for 5 successive dippings. Thus ticks that attached themselves were killed before they could complete engorgement. Care was taken to prevent extraneous contamination of both the central and neutral areas. From September 1930 until the spring of 1932 the area was left vacant. Thus all ticks except those that fed on alternative hosts were either removed and killed by repeated serial dippings or starved to death for want of a blood meal. About the middle of April 1932, 10 dipped sheep were placed in the central area and accurate counts were made every fourth or fifth day of the female and nymphal ticks attaching themselves to the head, neck and ears of 5 of these sheep. As a control, similar counts were made on a group of 12 sheep on the adjacent tick-infested pastures. Although the degree of infestation was markedly greater in sheep grazing on the ordinary pasture, there was a regular and appreciable infestation of those on the central area. It would thus appear that in the central area, a tick population of appreciable size was maintained by small animals and birds, since no tick had engorged on sheep for the past 3 years. Moreover, the number of possible alternative hosts had been much reduced. Hares were known to have leapt over the fence, but apart from them the only mammals known to harbour ticks and likely to have gained entry were weasels and stoats. It is not known whether this tick feeds on mice and voles. The only other possible hosts were the common moor birds. It would appear, therefore, that the removal of sheep from a particular area for a number of years would not eradicate *I. ricinus*.

HANCOCK (G. L. R.). **The Mosquitoes of Namanve Swamp, Uganda. With an Appendix on the Estimation of Organic Carbon in Waters by G. Griffith.**—*J. Anim. Ecol.* **3** no. 2 pp. 204–221, 3 pls., 11 refs. Cambridge, November 1934.

A detailed account is given of observations on the mosquito population of this swamp in Uganda, based mainly on weekly collections of larvae from selected pools in various plant communities made between 15th March 1932 and 29th March 1933, the primary object being to ascertain the effects of draining and planting on the Anopheline fauna [*cf. R.A.E.*, B **22** 83].

The following is taken from the author's summary and conclusions: Namanve swamp contains a considerable mosquito fauna, which varies according to the nature of the different parts of the swamp and with the work of reclamation. The factors of pH, light, temperature and organic matter (carbon) in solution are considered, and some of these have been correlated with the presence or absence of certain species of mosquitos. From the viewpoint of the malariologist, Namanve swamp was originally innocuous except for a very narrow fringe of papyrus where *A. moucheti*, Evans, and probably also *A. funestus*, Giles, occur. It was only when reclamation began that conditions became suitable for *A. gambiae*, Giles, and this only to a very limited extent. It has been shown that at Namanve there is a direct transition from *Miscanthidium* or papyrus swamp to *Phoenix* swamp. In other swamps there is an intervening grass zone, and from the point of view of the malariologist this is probably the zone of

greatest importance. The critical factor appears to be that of organic matter ; if rain or springs induce in a grass zone, where the light is already intense, a considerable dilution of the organic matter in solution, or carry with them suitable food organisms, then this grass zone is the critical area.

CURRY (D. P.). **Breeding of Anopheline Mosquitoes among Aquatic Vegetation of Gatun Lake, accompanied by periodic long Flights of** *A. albimanus* **Wied.**—*Sth. med. J.* **27** no. 7 pp. 644–649, 1 ref. Birmingham, Ala., July 1934.

An account is given of the vegetation and Anopheline fauna of Gatun Lake, Panama Canal Zone [*cf. R.A.E.*, B **21** 64 ; **22** 72, etc.]. It is pointed out that the purpose of the new Madden Dam across the upper Chagres River is to supply water to the lower Gatun Lake in the dry season and to control floods during the wet season. When it is functioning, there will be less fluctuation in the level of the Gatun Lake, and it is hoped that there will therefore be far less *Chara* and bladderwort (*Utricularia mixta*) exposed at the surface at the end of the dry season and that in consequence the breeding of Anophelines will be greatly reduced.

MARTINI [E.] & ZOTTA [G.]. **Races d'***A. maculipennis* **en Roumanie. Rapport sur un voyage d'étude effectué à travers la Roumanie pendant les mois d'août et de septembre 1933.**—*Arch. roum. Path. exp. Microbiol.* **7** no. 2 pp. 135–209, 2 pls., 6 figs., 6 graphs. Paris, June 1934.

This study on the distribution of the various races of *Anopheles maculipennis*, Mg., in Rumania was undertaken to see if it would explain the irregular distribution of malaria. It was carried out in areas where anti-malaria measures were being most vigorously prosecuted, *i.e.*, localities near Jassy, in the Department Ilfov, and on the lower Danube and its delta, as well as in parts of the Department of Vlasca where the spleen index was high and in the district of Constanza on the coast.

Details are given of the itinerary followed, the technique used in handling the mosquitos, their distribution, the characteristics of their eggs, the sources of error in collecting and analysing data, and the distribution of malaria.

The data on the distribution of the different races agree with those obtained in Germany [*cf. R.A.E.*, B **21** 177, etc.]. In both countries *messeae*, Flni., is the race occurring in regions of pure fresh water lakes and streams, and *atroparvus*, van Thiel, the race of brackish water not only along the coast but also inland, whereas *maculipennis* (*typicus*) constitutes a large proportion of the mountain fauna and is also found here and there in association with either *messeae* or *atroparvus*. Towards the south along the Black Sea coast *A. sacharovi*, Favr (*elutus*, Edw.) gradually takes the place of *atroparvus* [**22** 202], but *labranchiae*, Flni., has not been found.

Data on the intensity and distribution of malaria were furnished by local authorities. In one place near Jassy there was little malaria in spite of the abundance of mosquitos, and the authors formulated the theory that in dry localities mosquitos tend to infest villages, but that in places such as the one under discussion, where there are

immense stretches of ponds, marshes and reeds, the mosquitos find damp and shady hiding places among the reeds. At night the mosquitos from the village mix with the swarms from the marshes, and the chances are against the same individuals returning to the village. In the Jassy area, the incidence of malaria is not directly related to the numbers of mosquitos ; it seems to be highest where the percentage of *atroparvus* is greatest, moderate in the localities in the Pruth valley where *messeae* predominates and lowest in the places where *maculipennis* is found almost exclusively.

In spite of the almost exclusive predominance of *messeae*, the malaria incidence in the upper Danube valley does not appear to be lower than in those parts of Ilfov where *atroparvus* is also present, a fact that might be explained by the greater numbers of Anophelines in the former. In the valley of the Cîlnistea (Vlasca), a less abundant Anopheline fauna produces as high an incidence of malaria as the more abundant fauna of the upper Danube, but the disease is more virulent, a phenomenon that may be explained by the presence of *atroparvus*. The situation in the Danube delta [**21** 125] and in the coastal region of Constanza [**22** 202] have already been discussed.

PEUS (F.). **Stechmücken-Winterbekämpfung ?** [Winter Measures against Mosquitos ?]—*Z. GesundhTech. Städtehyg.* **26** no. 11–12 pp. 629–636. Berlin, 1934.

It is pointed out that winter work against mosquitos sometimes carried out by local authorities in Germany may be of some value against species of *Culex* or *Theobaldia* but not against *Aëdes*.

LIESE (W.). **Ist eine Herabsetzung der Lüftungszeit nach Durchgasungen mit T-Gas (Aethylenoxyd) möglich ?** [Is a Reduction possible in the Time required for Ventilation after Fumigation with T-Gas ?]—*Z. GesundhTech. Städtehyg.* **27** no. 1 pp. 7–16, 7 refs. Berlin, January 1935.

German regulations require ordinary rooms to be ventilated for at least 20 hours and trade premises for at least 12 hours after fumigation with T-gas (10 parts ethylene oxide and 1 part carbon dioxide). Experience suggested that these periods could be shortened, and as a result of experiments here described, a ventilation period of 6 hours is stated to be sufficient for all rooms provided that the fumigation period is 24 hours and a very exact determination of the gas residue is made before use of the premises is permitted.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection.]—*Beil. NachrBl. dtsch. PflSchDienst* **7** no. 2 pp. 15–26. Berlin, 1st February 1935.

This part includes (pp. 15–16) an order of 10th October 1934 modifying the regulations governing the use of ethylene oxide as an insecticide in Germany. After fumigation, rooms must be thoroughly ventilated for at least 6 hours. All doors, windows and other apertures must then be closed for 1 hour and the temperature raised, if possible, to 15°C. [59°F.]. A sample of the gas residue must then be taken and if not more than 0·5 mg. ethylene oxide per litre is found in the free air and between cushions, etc., the premises can be used.

Shannon (R. C.). **Malaria Studies in Greece. The Reaction of Anopheline Mosquitoes to certain Microclimatic Factors.**—*Amer. J. trop. Med.* **15** no. 1 pp. 67–81, 1 diagr., 8 refs. Baltimore, Md., January 1935.

It has been suggested [*R.A.E.*, B **21** 137] that instances of the absence of malaria in places where Anophelines are abundant may be explained by the preference of different races or species of the latter for particular microclimates, so that a change in microclimates resulting from a general change in the type of housing for man or domestic stock may be of importance in freeing a region from the disease. The experiments described were carried out in Greece chiefly during the summer seasons of 1933 and 1934 to test the microclimatic preferences of mosquitos during the daytime. Two tunnels were excavated, one with its entrance inside a stable and the other in a clay bank facing due east, and various microclimates were created by means of partial partitions of wood, which reduced the light intensities and so regulated the temperatures and humidities in the tunnels. Both tunnels were easily accessible to Anophelines, which were free to come and go, so that the type of microclimate selected was presumably the one preferred. The three vectors of malaria in Greece, *Anopheles sacharovi*, Favr, *A. superpictus*, Grassi, and *A. maculipennis*, Mg. (both the typical form and race *messeae*, Flni.), were well represented among the mosquitos found in them.

From the results, the author concludes that light should be regarded as a definite microclimatic factor, since in nature temperature depends largely on the intensity and duration of light and humidity depends largely on temperature. Darkness normally indicates decreased temperatures and increased humidities. At dawn and until about half an hour after sunrise, temperatures and humidities within all types of structures approximate those occurring outside and the Anophelines appear to be guided to their daytime resting places by the intensity of light. In the clay-bank tunnel at dawn none of the Anophelines had stopped in the first section where the light intensity was 5 or more candle-foot power, the majority had stopped in sections two and three (1–5 candle-foot power), and comparatively few had entered the last section where the obscurity was more or less complete, although temperatures and humidities in all the sections at this time were almost uniform and were also favourable.

Collections made in the stable and within the tunnel opening into it showed that an increasing number of mosquitos sought the entrance to the tunnel as the temperature in the stable became higher, and that the percentage remaining in the stable at a given temperature when the windows were open was equal to that remaining in the stable when the windows were shuttered but the temperature was higher by 5°C. [9°F.]. A comparison of the total numbers taken at all temperatures showed that whereas when the windows were open 38 per cent. were in the stable and 62 per cent. in the tunnel entrance, when the windows were shuttered 72 per cent. remained in the stable and only 28 per cent. sought the tunnel entrance. The candle-foot power was approximately 5–15 when the windows were open, 2–5 when they were shuttered and 1–5 in the tunnel entrance. Excessive temperature tends to cause all Anophelines to seek even darker and consequently cooler quarters, and all the mosquitos sought the tunnel entrance when the temperature in the stable reached 40°C. [104°F.]. *A. superpictus*

appears to be somewhat more tolerant of light and higher temperatures than the other species, *A. maculipennis* being the least tolerant. The respective influences of light and temperature were more precisely illustrated in an experiment in which an earthenware jar containing both *A. sacharovi* and *A. maculipennis* was exposed to the direct rays of the mid-day sun. The insects remained in the jar until the interior had reached a temperature of 36°C. [96·8°F.], when they were forced out into the sunlight, thus showing that the forces of light and heat become equalised at this point. A few examples remained in the jar but none was observed to survive a temperature of 41°C. [105·8°F.].

The results of these investigations show that Anophelines choose their daytime resting places in accordance with microclimatic conditions and that each of the species considered differs to some extent in its preferences. *Culex pipiens*, L., shows a much greater preference for darker and cooler microclimates ; 154 examples of this species were found in the tunnel entrance in the summer of 1933 but none in the main room of the stable.

Barraud (P. J.). **A Practical Entomological Course for Students of Malariology.**—*Hlth Bull.* no. 18 (*Malar. Bur.* no. 9), 141 pp., 18 pls., 92 refs. Delhi, Manager of Publications, 1934. Price 2*s.* 9*d.*

This bulletin, which was prepared primarily for use at the malaria classes of the Malaria Survey of India, at Karnal, Punjab, may also be of value in organising classes elsewhere, particularly under Indian conditions, and to workers in the field. It gives the substance of 14 lectures and 14 sessions of practical work dealing with the purely entomological side of malaria control work, and includes such subjects as the recognition of all stages of mosquitos, the rearing of Anophelines, the identification of the adults and larvae of Indian Anophelines with notes on their bionomics, the collection, mounting, examination and dissection of specimens, and the natural enemies and parasites of mosquitos. An endeavour is made to refer to all essential points, but where a lecture deals with a subject described in detail elsewhere in this series of Health Bulletins, the subject matter is not always given in full. Lists of diagrams and objects to be shown at each lecture and of the specimens needed for distribution and exhibition in the demonstration classes are given. The appendices deal with the classification of the tribe Anophelini, the species and varieties of *Anopheles* found in India with recent changes in their nomenclature, alternative names for various parts of the thorax and wings, classified references, and the equipment supplied to students at the Karnal malaria classes.

Sinton (J. A.). **Suggestions with regard to the Prevention of the Spread of Yellow Fever to India by Air Traffic, with special reference to Insect Transmission.**—*Hlth Bull.* no. 20, 34 pp., 17 refs. Delhi, Manager of Publications, 1934. Price 6*d.*

The author discusses the danger of the introduction of yellow fever into India by means of aeroplanes and points out that in India there is not only a susceptible human population but the two common brown monkeys [*Macacus*], which are ubiquitous and often live in

close association with man, are also susceptible [*R.A.E.*, B **17** 31]. *Aëdes aegypti*, L., the principal vector, is a common domestic insect in most parts of India and has been recorded from the chief international aerodromes; moreover, several of the potential vectors of the disease also occur in India. It would appear that climatic conditions over a very large part of the country are favourable, at least during the greater part of the year, for the development of infectivity in the vector.

Measures for preventing the introduction of yellow fever in shipping have already been provided in international maritime regulations, so that those here discussed apply only to its introduction by air. After reviewing the literature on the carriage of mosquitos by aeroplanes, the author suggests various measures that should be taken at the places of departure, intermediate stopping places and destinations. These include the screening and spraying of hangars and aeroplanes, the medical inspection of passengers and crew, the transference of passengers travelling from infected countries to a different aeroplane, possibly at a different port, for embarkation to infectible countries, the abolition or inspection of stored water both on board and in the ports and their vicinity, etc. Whatever precautions are decided on, a proper clearance certificate should be given to the pilot as is done in the case of captains of ships under similar circumstances.

The final section of the bulletin deals with the lines on which research should be carried out to investigate the number of mosquitos imported into India by air, the construction and type of aeroplanes in relation to the carriage of mosquitos, the measures to prevent their entering and leaving aeroplanes, and the best method for freeing aeroplanes and particularly luggage from them.

MORIN (H. G. S.). **Note préliminaire sur un dispositif économique pour la destruction des larves d'anophèles dans certains ruisseaux.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 8 pp. 743–746, 3 figs. Hanoi, 1934.

The control of Anopheline larvae in streams by means of flushing necessitates manipulation by hand of the sluice gates at short intervals. The author describes an apparatus invented by de Villiers in Penang that works automatically, a reservoir that fills slowly being emptied rapidly by means of a large siphon as soon as the water has reached a given level. The contrivance costs little and might be used with advantage in Indo-China, particularly where funds do not allow a permanent inspection service to be established.

GUY (R.). **Note sur l'endémie palustre à Luang-Prabang (Haut-Laos).**—*Bull. Soc. méd.-chir. Indochine* **12** no. 8 pp. 766–791, 3 graphs, 1 diagr., 1 fldg map. Hanoi, 1934. **Quelques index d'endémicité palustre dans la Haute-Région laotienne (Luang-prabang).**—*T.c.* pp. 792–806, 1 map.

In these papers on the intensity and distribution of malaria in localities in the valleys of the upper Mekong River and its tributaries, the author includes the results of Anopheline and malaria surveys carried out at Luang Prabang and Paklay [*R.A.E.*, B **22** 32, 63; **23** 56].

EJERCITO (A.). *Anopheles maculatus* **Theobald, another Malaria Vector in the Philippines.**—*J. P. I. med. Ass.* **14** no. 9 pp. 342–346, 7 refs. Manila, September 1934. [Recd. February 1935.]

The author summarises the work that has been done on *Anopheles maculatus*, Theo., in the Philippines, much of which was recorded in papers already noticed [*R.A.E.*, B **3** 65; **17** 64; **19** 186; **22** 243], with a view to determining its status as a vector of malaria. A total of 5,401 examples caught in 15 different places were dissected between 1st September 1927 and 31st October 1932. In February 1931, among 42 females taken in a trap in a room in which there were several cases of malaria, three had oöcysts in the stomach and one also sporozoites in the glands. In June 1932 oöcysts and sporozoites were found in one example out of 296. When 57 laboratory bred females were fed on patients infected with *Plasmodium falciparum*, 3 became infected. Larvae of *A. maculatus* were found in 8 of the 35 malarious areas in which Anopheline breeding places were surveyed. In a non-malarious locality it was breeding extensively and malaria carriers were noted coming from malarious areas a short distance away. It is suggested that the climatic factors of this locality (4,300 ft. altitude) do not favour the development of the parasites within the mosquito, that the local *A. maculatus* may be a non-susceptible variety, or that the food, habits or environment may prevent it from becoming infected. It is concluded that *A. maculatus* is probably a vector in the Philippines but is not of major importance.

HINMAN (E. H.). **The Rôle of Bacteria in the Nutrition of Mosquito Larvae. The Growth-stimulating Factor.**—*Amer. J. Hyg.* **18** no. 1 pp. 224–236, 15 refs. Baltimore, Md, July 1933.

A summary is given of the experiments on the importance of bacteria in the nutrition of mosquito larvae carried out over a period of 4½ years in the course of a comprehensive study of the food of mosquito larvae of which certain results have already been noticed [*R.A.E.*, B **18** 233; **20** 201, 204; **21** 144]. It was found that the appearance of moderate numbers of bacteria in culture media stimulates the growth of larvae, but excessive contamination almost invariably results in their death. The autoclaving of otherwise suitable media renders them unfavourable for larval development. Similarly, killing bacterial cultures (non spore-formers) at low temperatures destroys the growth-stimulating factor. Bacterial cells killed chemically (with formaldehyde) also failed to produce growth. An attempt was made to isolate the growth-stimulating element from bacteria. This vitamin-like substance is apparently not extra-cellular since the bacterial filtrate from cultures failed to stimulate development; it is at least not filtrable. If this accessory food factor is not a product of excretion or a by-product of metabolism of bacteria, it would seem logical to believe that it is contained within the bacterial cells. Attempts were therefore made to extract the essential substance from large masses of bacterial cells by grinding with various solvents. This work was attended by many failures, and the growth-stimulating factor was not extracted with any regularity, although in a few instances apparently successful results were obtained. It is suggested that fungi and yeasts may play a similar part in nutrition. It is concluded that

micro-organisms of various types have a marked influence on the nutrition and metabolism of invertebrates in supplying elements controlling many of their life processes.

ROZEBOOM (L. E.). **The Relation of Bacteria and Bacterial Filtrates to the Development of Mosquito Larvae.**—*Amer. J. Hyg.* **21** no. 1 pp. 167–179, 8 refs. Baltimore, Md, January 1935.

The experiments described were undertaken to determine whether materials put into solution by the action of bacteria on organic material found in the breeding places of mosquitos are of more value in the nutrition of the larvae than the bacteria themselves. Attempts were also made to rear sterile larvae and to demonstrate a growth-promoting factor [see preceding paper].

The following is taken from the author's summary and conclusions: No evidence could be found that solutes and colloids (in water from natural breeding places sterilised by filtration) are a source of nutriment to mosquito larvae. Bacteria can be utilised to a certain extent, but all kinds are not equally suitable. When they were the only source of food, the best development occurred in suspensions of environmental bacteria obtained from the natural breeding places of mosquitos. The larvae of three species of *Culex* were found to be more exacting in their food requirements than those of *Aëdes aegypti*, L. Attempts to rear mosquito larvae in the absence of bacteria were unsuccessful, sterilisation of the various media used in this investigation rendering them unsatisfactory. No development took place in sterile, unheated blood. Contamination of any of the media with suitable bacteria rendered them satisfactory for the development of the larvae. No evidence could be found that the beneficial effects of bacteria in an otherwise unsuitable medium were due to either extra- or intracellular growth-promoting factors, or to the action of proteolytic enzymes furnished by the bacteria.

COWDRY (E. V.) & REES (C. W.). **An Attempt to ascertain the Behavior of *Anaplasma marginale* in Ticks transmitting Anaplasmosis.**—*Amer. J. Hyg.* **21** no. 1 pp. 94–100, 21 refs. Baltimore, Md, January 1935.

Details are given of experiments already noticed [*R.A.E.*, B **23** 68] in which no trace of a microscopically demonstrable organism was found in the ticks, *Dermacentor variabilis*, Say, and *D. venustus*, Banks (*andersoni*, Stiles) that transmitted anaplasmosis of cattle, other than organisms also present in uninfected control ticks of both species.

MATTHES (H. C.). **A Study of the seasonal Distribution of *Anopheles* in Houston, Texas.**—*Amer. J. Hyg.* **21** no. 1 pp. 233–248, 2 graphs, 9 refs. Baltimore, Md, January 1935.

In a survey of the southern part of the city of Houston, Texas, and its immediate vicinity and also of a rice-growing district 15 miles away, carried out from March 1932 to January 1934, the Anophelines collected were *Anopheles quadrimaculatus*, Say, *A. crucians*, Wied., *A. punctipennis*, Say, and *A. pseudopunctipennis*, Theo., of which only the first was sufficiently numerous to be of economic importance. The seasonal distribution of this species was studied and an attempt

made to evaluate the various ecological factors involved in producing fluctuations in its numbers.

The following is taken from the author's summary and conclusions: Although *A. quadrimaculatus* breeds throughout the year, it is most active from April to October. The other three species occur chiefly during the colder periods of the year. Larvae of *A. quadrimaculatus* were found in a large variety of breeding places in the city and were also abundant and widespread in the rice-fields. When the temperature dropped below 20°C. [68°F.], the number of adults decreased rapidly, regardless of the condition of the breeding areas, but when it rose to 22–23°C. [71·6–73·4°F.], the numbers definitely increased if suitable breeding places were available. *Gambusia affinis* was the only natural enemy found that can be considered of economic importance.

TREILLARD (M.). **Gîtes, sites ou régions, dans la localisation des espèces anophéliennes de l'Indochine méridionale.**—*Bull. Soc. Path. exot.* **28** no. 1 pp. 40–42, 1 ref. Paris, 1935.

From experience in Indo-China, the author points out that in the present state of knowledge it is impossible to define, except in a very generalised manner, the types of breeding place that are suitable for different species of Anophelines, or to decide whether breeding will occur in an apparently favourable site. Furthermore, biological factors that affect the adult may prevent the occurrence of a species in an area in which suitable breeding places are available.

TREILLARD (M.). **Tableau synoptique pour la détermination rapide des anophèles d'Indochine. 2. Larves.**—*Bull. Soc. Path. exot.* **28** no. 1 pp. 42–44, 1 diagr. Paris, 1935.

A synoptic table, similar to that devised for the adults [*R.A.E.*, B **23** 35] but not applicable to living individuals, is given for the identification of the larvae of the species of *Anopheles* occurring in Indo-China.

CAMINOPETROS (J.). **Sur la faune des phlébotomes de la Grèce. Leur distribution dans les foyers de kala-azar.**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 450–455, 8 refs. Paris, 1934. **Addition à la liste de phlébotomes signalés pour la première fois en Grèce.**—*Op. cit.* **28** no. 1 pp. 44–46, 2 refs. Paris, 1935.

In view of the findings regarding *Phlebotomus perniciosus*, Newst., in Algeria [*R.A.E.*, B **21** 218], investigations were begun in Greece in 1931 to determine whether other species of the group of *P. major*, Ann., that are known to be susceptible to infection with *Leishmania infantum* would show similar preference for dogs and similar larval habits. Dogs in Greece usually live in houses, but observations were also carried out in the kennels of a pound situated at the outskirts of Athens near a quarter where cases of both human and canine kala-azar are fairly numerous. Athens is an important focus of kala-azar, and occasional cases of oriental sore are observed every year. In 1933 investigations were also undertaken in other foci of visceral leishmaniasis. A table shows the localities, dates and generally the hours of capture and species of the 1,655 examples of *Phlebotomus* taken during 1931–33. The species were *P. papatasii*, Scop., *P. sergenti*, Parr., *P. major*, *P. tobbi*, Adl. Thdr. & Lourie, and *P. parroti* var. *italicus*, Adl. & Thdr. The last three, which have not previously

been recorded from Greece, were found indiscriminately in houses and kennels, so that their food preferences could not be determined. *P. parroti* var. *italicus*, which feeds exclusively on cold-blooded animals, was found in bedrooms. *P. tobbi* and *P. major*, which have been considered nocturnal in habit, were taken in dwellings in the morning and several hours before sunset [*cf.* **20** 230]. It is concluded that the presence of species of the group of *P. major* in a dwelling is chiefly dependent on its construction, special conditions of darkness and humidity being necessary if they are to remain permanently in it.

In the second paper is recorded the capture of 5,495 sandflies in Athens and two other localities between May and October 1934. In addition to the species already mentioned they included *P. sergenti* var. *alexandri*, Sinton, *P. chinensis* var. *simici*, Nitz., and a variety of *P. minutus*, Rond., none of which has previously been recorded from Greece.

FOLEY (H.) & PARROT (L.). **L'assainissement de l'oasis d'El Goléa. La question du paludisme.**—*Arch. Inst. Pasteur Algérie* **12** no. 4 pp. 471–484, 3 pls., 1 map. Algiers, 1934.

An account, based on records and on a survey in January 1934, is given of the malaria situation in the Oasis of El Goléa in the Algerian Sahara. The Anophelines that have been recorded are *Anopheles multicolor*, Camb., and *A. sergenti*, Theo. The authors consider that the control of malaria should consist in major drainage operations and administrative measures to prevent the formation of breeding places.

DREYFUSS (A.). **Etude géographique et médicale de l'annexe de Laghouat.**—*Arch. Inst. Pasteur Algerie* **12** no. 4 pp. 485–547, 6 pls., many refs. Algiers, 1934.

In the course of this account of conditions in Laghouat (southern Algeria), the author states that no Anopheline has been found by him or previously recorded from this locality and any malaria observed is probably imported. Lice [*Pediculus*] are numerous, and outbreaks of typhus occur at intervals. Oriental sore is present and is probably transmitted by *Phlebotomus papatasii*, Scop. Other species of *Phlebotomus* collected by the author during April–June 1934 were *P. minutus*, Rond., *P. parroti*, Adl. & Thdr., *P. perniciosus*, Newst., *P. fallax*, Parr., *P. sergenti*, Parr., and *P. squamipleuris* var. *dreyfussi*, Parr. [*cf. R.A.E.*, B **22** 80].

BOUVIER (G.). **Note sur les tsé-tsés et les trypanosomes du Secteur Nord "Pastorale," Katanga.**—*Ann. Soc. belge Méd. trop.* **14** no. 4 pp. 401–407, 1 map. Brussels, December 1934.

The plains of the northern sector of Katanga form excellent pastures, where both cattle and game are abundant. All the numerous rivers are more or less infested by *Glossina*, and 2,409 examples of *G. palpalis*, R.-D., and 2 examples of *G. fusca*, Wlk., were caught in a fortnight. Of 859 flies dissected 17 (1·97 per cent.) were found to be infected with trypanosomes. None of the 315 flies examined from one district were infected, although cases of trypanosomiasis of bovines were reported, and it is suggested that the disease may have been transmitted mechanically, as Tabanids, particularly *Chrysops stigmaticalis*,

Lw., and *C. distinctipennis*, Aust., were numerous. The parasite resembled *Trypanosoma congolense*, but was difficult to transmit to guineapigs.

Robinson (W.) & Norwood (V. H.). **Destruction of Pyogenic Bacteria in the Alimentary Tract of Surgical Maggots implanted in infected Wounds.**—*J. Lab. clin. Med.* **19** no. 6 pp. 581–586, 19 refs. St Louis, Mo., March 1934.

When sterile maggots are implanted in infected wounds they remove dead tissue and pus from the wound; at the same time they take up large numbers of bacteria and by destroying them aid in reducing the infection. The investigation described was undertaken to determine by means of dissections and cultures the relative abundance and viability of the bacteria in the successive regions of the alimentary tract of *Lucilia sericata*, Mg. The technique is described. The results show that large numbers of the bacteria (a betahaemolytic streptococcus and a haemolytic type of *Staphylococcus aureus*) taken in with the food were destroyed in passing through the long tubular stomach of the maggot and that complete destruction of any remaining organisms occurred in the intestine, for no viable bacteria were found in any cultures of the intestine. The disappearance of the bacteria between the fore-stomach and the intestine, in the region of the greatest activity of proteolytic enzymes according to Hobson [*R.A.E.*, B **19** 216], indicates that the bacteria are destroyed by digestion [but *cf.* **23** 57].

Robinson (W.) & Simmonds (S. W.). **Effects of low Temperature Retardation in the Culture of Sterile Maggots for Surgical Use.**—*J. Lab. clin. Med.* **19** no. 7 pp. 683–689, 3 refs. St Louis, Mo., April 1934.

In the course of rearing blow-fly maggots for treating infected wounds, it is frequently necessary to retard the growth of certain immature stages. This is usually accomplished by subjecting a given stage to low temperatures [*R.A.E.*, B **20** 125, 127]. An investigation was undertaken to determine the effect of this retardation on the egg, larva, prepupa and pupa of *Lucilia sericata*, Mg., held for various periods at temperatures of 40–43°F.

The following is largely taken from the author's summary and conclusions: Eggs may be kept in a closed container for up to 28 hours with a mortality only slightly greater than normal, but continued storage is unfavourable and almost all the eggs are killed in 3 days. The age of the egg when stored affected the degree of injury. The lowest mortality occurred when eggs were allowed to remain in the warm incubator for an additional two or three hours after removal from the fly cages before being stored. The maggots do not withstand storage well. After 24 hours only 40 per cent. were able to resume feeding and in 6 days almost all were dead. Prepupae are best adapted to cold storage. They lose weight and shrink, but this is due chiefly to loss of water. The least unfavourable results were obtained with a relatively airtight container. In 33 days, mortality, the degree of which depended on the method of storage, ranged from 33 to 46 per cent., and in 7 weeks it had increased to approximately 38–55 per cent. However, when prepupae were stored for 3–4 weeks, the females that

emerged were permanently injured and their egg-laying capacity was much reduced. Pupae were unable to withstand even a moderate period of retardation ; after the second week, mortality rose to about 66 per cent., and most of the eggs laid by the females that emerged failed to hatch. It is concluded that retardation by low temperatures causes such a high mortality that its use is limited. The growth of the maggots may be retarded by feeding them on a food consisting of 1 part of evaporated milk to 5–7 parts of water to which is added 1·5 per cent. plain agar, the mixture being cooked for 25 minutes in a double boiler [*cf.* **22** 99].

Beveridge (W. I. B.). **Some Field Observations on the Blowfly Problem.**—*Aust. vet. J.* 1934 p. 64 (reprint 4 pp.). Sydney, April 1934. [Recd. February 1935.]

Observations on the blowfly problem in central western New South Wales in 1931 showed that strike was considerably higher among sheep in fields through which streams flowed than in those where the only surface water was in ponds or troughs. The suggested explanation is that the higher atmospheric humidity along the streams favours bacterial activity in the fleece and on the skin of the sheep, thus rendering it more attractive to the fly. Moreover, the sheep rest during the day under the trees along the banks of the stream, whereas in the other pastures the trees are not usually situated round the ponds and troughs and the sheep rest elsewhere. The larger fly population along the streams and the greater activity of the fly owing to the higher humidity may also be partly responsible. Among shorn sheep 5–7 months old, about 50 per cent. were affected with water rot and about 10 per cent. were struck, but in sheep of the same age that had not been shorn only about 10 per cent. showed water rot and only 2 per cent. were struck. This suggests that the shorter wool of younger sheep accounts for their being more susceptible to water rot (and consequently to strike) than the older sheep. Wetting by urine and the accumulation of organic constituents are probably important factors in crutch strike in ewes.

In attempts to assess the value of jetting, only the reduction in number of sheep struck is usually considered, whereas the diminished severity of the strike should also be taken into account. To avoid the irritant action of dressings designed to kill the maggots, the author recommends that the maggots be removed and an emollient dressing applied to promote rapid healing. Borax is both an emulsifying agent and a good stomach poison and excellent results have been obtained with an emulsion containing borax and oily repellents. The effectiveness of contact larvicides and repellents was found in the field to vary with the temperature ; repellents were more effective during hot weather, probably owing to the greater vaporisation of their volatile constituents. A dressing used as a contact insecticide should be thinner when used in cooler months. Dressings applied immediately after the operations of marking and tailing are largely washed away by the flow of blood, and the only way to prevent strikes in these wounds when flies are numerous is to dress the wounds two or three days later. In late autumn and late spring strikes sometimes heal spontaneously ; in such cases the author has several times observed in the fleece next to the skin, pupae, pupal cases from which the flies have emerged, and, during cold weather, adult flies.

Ono (S.) & Yamasaki (T.). **On the Bionomics of the Warble Fly observed in the Vicinity of Ohri, Inner Mongolia.**—*J. Jap. Soc. vet. Sci.* **13** no. 3 pp. 213–223, 2 pls., 4 refs. Tokyo, September 1934. (With a Summary in English.)

The following is taken from the authors' summary: In the spring of 1934 observations were made on the habits of warble-flies in the vicinity of Ohri, Inner Mongolia, where both *Hypoderma lineatum*, Vill., and *H. bovis*, DeG., occur. The larva usually emerges from the warble during the day, when the cattle are in the field and not in the cowshed. Among 200 cattle examined, 26 were infested with eggs, the majority of which had been deposited on the hairs of the dewlap. Examination of two calves killed at the end of May showed in one case 106 larvae in the serous membrane surrounding the trachea and the oesophagus, 21 in the pericardium and 30 in the submucosa of the oesophagus, those in the submucosa being somewhat larger than the others, and in the other case an almost equal number of larvae in the thoracic cavity and the submucosa of the oesophagus, those in the latter situation again being somewhat larger. In the latter case the oedema observed in the pleura and the pericardium was probably caused by the migration of the larvae.

Wehr (E. E.). **Observations on the Length of Time First Stage Larvae of** *Gasterophilus intestinalis* **remain in the Tongue of the Horse.**—*N. Amer. Vet.* **14** pp. 35–41. Evanston, Ill., October 1933.

The author describes further experiments on the biology of *Gastrophilus intestinalis*, DeG. [*cf. R.A.E.*, B **22** 70], in which the technique used was the same but the larvae were applied to the tongues of two horses once a week for 5 weeks and the animals killed 7 and 8 days after the last application. In the stomach of one horse there were 51 larvae in the second instar in two distinct stages of growth, and in the tongue and fauces 26 larvae in three stages of growth. The five stages of growth corresponded to the five applications of larvae. Of 1,550 larvae applied, 77 were recovered. From these findings it is inferred that all the larvae from the first and second applications, made 35 and 28 days before the animal was killed, had reached the stomach, whereas those from the third application, made 21 days previously, were still in the tongue. The observation that the youngest larva removed from the stomach was practically indistinguishable in size and degree of development from the 3 larvae attached to the mucous lining of the fauces indicates that only a short time is needed for the passage of the larvae from the tongue to the stomach. The results obtained from the second animal confirmed those from the first one. It is concluded that if the eggs present on the body of a horse are destroyed at the time the adult flies disappear in the autumn, it may be treated for internal infestation a month later, since by that time all the larvae will have reached the stomach.

Marshall (J. F.) & Staley (J.). **Exhibition of "Autogenous" Characteristics by a British Strain of** *Culex pipiens* **L. (Diptera, Culicidae).**—*Nature* **135** no. 3401 p. 34. London, 5th January 1935.

On 6th October a raft consisting of 105 eggs of *Culex pipiens*, L., was found in Hampshire in an outdoor tank in which *Chara* was growing. Larvae from these eggs were reared in the laboratory at

temperatures between 10–18°C. [50–64·4°F.] in ditch water to which crumbs of wholemeal bread were added at intervals. With a view to obtaining freshly emerged adults for mounting, some of the larvae were transferred on 1st November to a small breeding jar and placed near a radiator. Pupae first appeared on the 8th and adults on the 12th. Two rafts consisting of 38 and 40 eggs were observed in the jar on the 23rd and 24th respectively, although the females had never been given a blood meal. Larvae hatched from these eggs on 26th–27th November. The space in which the adults were confined was about 36 cu. ins. This is thought to be the first record of autogenous characteristics exhibited by a British strain of *C. pipiens*.

FINDLAY (G. M.), HEWER (T. F.) & CLARKE (L. P.). **The Susceptibility of Sudanese Hedgehogs to Yellow Fever.**—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 4 pp. 413–418, 1 pl., 4 refs. London, January 1935.

The authors' experiments showed that *Atelerix albiventris* (*Erinaceus pruneri*), a hedgehog found in the Anglo-Egyptian Sudan, is susceptible to the viscerotropic strain of yellow fever virus inoculated subcutaneously, thus resembling the European hedgehog, *Erinaceus europaeus*. The significance of a susceptible animal occurring in regions where yellow fever is endemic [*cf. R.A.E.*, B **23** 82] is briefly discussed.

BAERG (W. J.). **Some poisonous Arthropods of southwestern Mexico (Chilopoda and Arachnida).**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 527–532, 3 refs. Columbus, Ohio, December 1934.

During August and September 1932, the author collected a number of scorpions, tarantulas, centipedes and black widow spiders (*Ladrodectus mactans*, F.) from various regions of Mexico. Tests in which certain of these Arthropods were allowed to bite rats showed that *Centruroides elegans*, Thorell, and *C. elegans* var. *limpidus*, Karsch, were dangerously poisonous. The bites of *L. mactans*, with which no test was made, are also reported by the natives to be dangerous.

HEARLE (E.). **Notes on *Simulium canadense* Hearle and *Simulium virgatum* Coquillet and its Varieties.**—*Canad. Ent.* **67** no. 1 pp. 15–18, 1 pl., 11 refs. Orillia, January 1935.

The author discusses the respiratory organs of the pupae of the comparatively few species of *Simulium* in which they are not of the usual filamentous type. These include *S. canadense*, Hearle, which was originally identified as *S. virgatum*, Coq. [*cf. R.A.E.*, B **18** 47] and in a subsequent paper [**20** 220], as a variety of that species. The pupae of a variety of *S. virgatum* have been found to have breathing organs of the usual filamentous type, so that *S. canadense* is a distinct species. It has been recorded only in British Columbia, where it is widely distributed.

DIOS (R. L.) & KNOPOFF (R.). **Sobre Ixodoidea de la República Argentina.**—*Rev. Inst. bact.* **6** pp. 359–412, 9 figs., 17 pls. Buenos Aires, 1934. [Recd. February 1935.]

Descriptions are given of the adults, and in some cases of the larvae and nymphs, of the ticks studied by the authors in Argentina. Notes

on their biology are taken from the literature and brief notes on synonymy are given. The authors found the following species: *Amblyomma pictum*, Neum., and *A. maculatum*, Koch, on dogs; *A. dissimile*, Koch, on a toad (*Bufo paracnemis*); *A. furcula*, Dön., on horses and cattle; *A. brasiliense*, Aragão, on man; *A. cayennense*, F., on horses and cattle; *A. rotundatum*, Koch, and *A. testudinis*, Conil, on reptiles; *A. altiplanum*, Dios, on llamas; *A. ovale*, Koch, on a fox; *Ornithodorus talaje*, Guér., and *O. megnini*, Dug., on cattle; *O. turicata*, Dug., on pigs; and *Rhipicephalus sanguineus*, Latr., on horses.

KOUWENAAR (W.) & WOLFF (J. W.). **Onderzoekingen over Sumatraansche Rickettsiosen. vii. Infectieproeven mit mijtekoorts op** *Macacus fuscatus*, **de Japansche aap.** [Investigations on Sumatran Rickettsia Diseases. vii. Infection Experiments with Mite Fever on *M. fuscatus*, the Japanese Monkey.]—*Geneesk. Tijdschr. Ned.-Ind.* **75** no. 1 pp. 34–38, 1 pl., 5 refs. Batavia, 8th January 1935.

The experimental infection of Japanese monkeys (*Macacus fuscatus*) with the virus of Sumatran pseudotyphus or mite fever [*cf. R.A.E.*, B **13** 84, etc.] produced symptoms different from those of tsutsugamushi disease. Furthermore, one monkey which in Japan had proved immune from tsutsugamushi disease reacted to the Sumatran virus. It is therefore concluded that Sumatran mite fever and tsutsugamushi disease are not identical.

[BEKLEMISHEV (V. N.).] **Беклемишев (В. Н.). Ueber einige Gesetzmässigkeiten in der Larvenoekologie von** *Anopheles maculipennis*: **das Optimum der Pflanzenabundanz.** [On a governing Factor in the Ecology of the Larva of *Anopheles maculipennis*: the Optimum of the Height and Density of the Vegetation. (*In Russian.*)]—*Med. Parasitol.* **3** no. 5 pp. 361–377, 4 figs., 26 refs. Moscow, 1934. (With a Summary in German.)

This is a detailed discussion, largely based on the author's previous investigations and on the literature, of the effect of various types of aquatic plants on the presence and development of the larvae of *Anopheles maculipennis*, Mg. [*R.A.E.*, B **22** 75; etc.]. The main functions of plants in relation to mosquito breeding are to eliminate by chemical reaction the effect of products of decay on the larvae [**13** 109] and to serve as food [**20** 153]. Further, the plants enable the larvae to anchor themselves by the caudal hooks [**20** 153]; they reduce the movement of the water [**22** 78], afford protection from predators, serve as places for ovipositing females to alight, and in deep reservoirs often make it possible for the larvae to breed by forming a carpet below the surface.

The different types of aquatic plants are divided into three main groups, and the effects of the height and density of each type on larval life are discussed separately. The optimum conditions are usually found in pure communities of small-leaved Elodeids, which on reaching the surface of the water do not develop further, so that there is always sufficient space for the larvae. This optimum is only broken by the sinking of the water level, when the upper parts of the plants float and form a dense carpet unfavourable for the larvae. Freely floating Lemnids are only inimical to the larvae when they are so abundant

that they come into contact with the surface of the water, but even a moderate abundance of Nymphaeids and the Lemnids that have assimilative organs spread on the surface of the water causes unfavourable hydrochemical conditions, and a complete covering of the surface makes the existence of the larvae impossible, as no space is left for anchorage. Plants that rise above the water and shade it are unfavourable [*cf.* **22** 75], and no larvae of *A. maculipennis* or even of species such as *A. hyrcanus*, Pall., *A. claviger*, Mg. (*bifurcatus*, auct.), and *A. algeriensis*, Theo., which usually like shade, occur in waters overgrown with very tall reeds, etc., since the submerged vegetation is depressed and dead vegetable matter produces an unfavourable chemical reaction.

[Vinogradskaya (O. N.).] **Виноградская (О. Н.). The Varieties of** *Anopheles maculipennis.* **(Review of published Data.)** [*In Russian.*]—*Med. Parasitol.* **3** no. 5 pp. 378–383, 2 figs., 23 refs. Moscow, 1934.

[Beklemishey (V. N.) & Vinogradskaya (O. N.)] **Беклемишев (В. Н.) и Виноградская (О. Н.) Sur les variétés d'***Anopheles maculipennis* **trouvées dans l'URSS.** [*In Russian.*]—*T.c.* pp. 384–385. (With a Summary in French.)

The first paper contains information from the literature on the races of *Anopheles maculipennis*, Mg., with special reference to their distinction as suggested by Missiroli, Hacket and Martini [*R.A.E.*, B **20** 211 ; **21** 177]. The characters of the eggs of each race are described, and the differences in the biology of the larvae and adults are outlined, as well as the geographical distribution of the different races and their importance in the transmission of malaria.

The second paper presents preliminary results of two years' investigations on the races that occur in the Russian Union. Examination of a large number of eggs taken in different parts of the country showed that typical *maculipennis* occurs in various parts of the northern Caucasus and the environs of Saratov, and in small numbers near Moscow.

The predominant race near Moscow, and the only one in Kotlas on the Dwina and in Frunze in northern Kirghizistan was var. *messeae*, Flni.; it also occurred in parts of the northern Caucasus, and near Saratov. *A. sacharovi*, Favr (*elutus*, Edw.), which is here treated as a race of *A. maculipennis*, was found in the coastal zone of Daghestan, and was the only species present near Tashkent (north-eastern Uzbekistan).

Eggs similar in structure to those of *atroparvus*, van Thiel, were taken in the south-east of the northern Caucasus, though by the colour and pattern they rather resembled the eggs of *labranchiae*, Flni.

[Butyagina (A. P.), Vinogradskaya (O. N.) & Shmeleva (Yu. D.).] **Бутягина (А. П.), Виноградская (О. Н.) и Шмелева (Ю. Д.). The Influence of mechanical Prophylaxis on the Decrease of Malaria Spread in a Turf Region.** [*In Russian.*]—*Med. Parasitol.* **3** nos. 4–5 pp. 301–312, 385–395, 4 graphs, 13 refs. Moscow, 1934. (With a Summary in English.)

In a sedge peat district in the Moscow Government, the possibility of controlling malaria by using mosquito nets and screening huts was investigated during June–September 1933. Numerous accumulations

of water in turf-pits, which had a pH of 6·8–7·2 and contained dense vegetation, afforded favourable breeding places for *Anopheles maculipennis*, Mg. The adults abandoned their hibernation quarters about the end of April. First instar larvae were found in turf-pits near the village on 3rd May. The adults of the first generation began to emerge on the 17th June, but owing to cold weather became abundant only about the end of the month. Examination of females showed that gonotrophic concordance [*R.A.E.*, B **18** 53] only prevailed from mid-June till 10th August ; it coincided with the highest temperature in the summer (13·4–23°C. [56·1–74·4°F.]), when a single blood meal was sufficient to mature the eggs of most females. The number of females with immature ovaries and practically no fat-body (partial gonotrophic dissociation [*cf.* **22** 77]) began to increase after 20th August. Cases of complete gonotrophic dissociation were observed from 18th August, and they grew rapidly more numerous up to mid-September ; only a few females containing blood occurred towards the end of the month and none after 7th October. The adults were most active at temperatures of 11–21°C. [51·8–69·8°F.] combined with a relative humidity of 84–95 per cent. [*cf.* **22** 76], but at humidities lower than 70 per cent. they were inactive even when the temperature was 15–22°C. [59–71·6°F.]. They began to enter houses and animal quarters in numbers about half-an-hour before sunset and continued to do so throughout the night. Probably because the summer was cold, only a few attacked man in the open.

The peat bog was dusted 7 times with Paris green from an aeroplane, but the results were not very successful, as the applications were badly timed or inefficiently made.

Of 262 workmen supplied with mosquito nets only 1 contracted primary malaria and 3 had relapses, as compared with 14 and 15 respectively out of the 268 men in a control group. Among 127 men living in screened huts, there were only 3 primary infections and 3 relapses, whereas in the control group of 145, the corresponding numbers were 10 and 11. While only one mosquito was taken in traps in the screened huts in three days, 45 were taken in the unprotected ones. Of a total of 6,734 mosquitos taken in 2 cow-sheds and 4 huts, only 216 occurred in the latter. The importance of zooprophylaxis in the control of the disease is emphasised, and it is suggested that the number of cattle, etc., in the settlement should be increased, and that the animal quarters should be placed between the Anopheline breeding places and the village.

[Smirnov (E. S.) & Vladimirova (M. S.).] **Смирнов** (**Е. С.**) **и Владимирова** (**М. С.**). **The Accumulation of the Biomass in the Carrion Fly** *Phormia groenlandica.* (*In Russian.*)]—*Med. Parasitol.* **3** no. 5 pp. 401–402, 1 graph. Moscow, 1934.

With a view to studying factors governing the abundance of flies, laboratory experiments were carried out in Moscow with *Phormia terrae-novae*, R.-D. (*groenlandica*, Zett.), which is very common in Russia. Batches of newly hatched larvae, varying in numbers from 25 to 2,000 individuals, were placed on pieces of beef liver, each weighing 0·8 oz. The " biomass," calculated when the pupae were one day old, was expressed in the total weight of all the pupae obtained in each experiment, and represented by a curve. It was found that the weight of the pupae first increased with an increase in the original number of

larvae used to a maximum when the number was 600, and then dropped at first rather sharply and then more gradually to a minimum when the number was 2,000. The effect of competition for food was shown in a decrease in weight of the individual pupae, as well as in a reduction in the number produced.

[DERBENEVA-UKHOVA (V. P.).] **Дербенева-Ухова (В. П.). The Influence of Temperature on the Growth of the Larvae of the Flies** *Phormia groenlandica* **and** *Calliphora erythrocephala*. [*In Russian.*] —*Med. Parasitol.* **3** no. 5 pp. 403–405, 3 graphs. Moscow, 1934.

Larvae of *Calliphora erythrocephala*, Mg., and *Phormia terrae-novae*, R.-D. (*groenlandica*, Zett.) were subjected from hatching to pupation to different constant temperatures ranging from 14·5 to 35·5°C. [58·1–95·9°F.]. The different reactions of the larvae of the two species are shown by curves. Larvae of *Phormia* were more sensitive to deviations from their optimum of about 28°C. [82·4°F.], at which growth was completed in 4½ days and pupation began in 5. Larvae at 14·5°C. completed growth in 16½ days and pupated on the 20th day. In the case of those kept at 32°C. [89·6°F.], there was a high mortality from the beginning of development, and all died in the third instar. The highest mean daily weight of the larvae and the quickest development occurred at the same temperature.

The optimum temperature for development of the larvae of *Calliphora* was about 31°C. [87·8°F.], at which growth was completed in 4½ days and pupation started in 7 days. A decrease in temperature retarded development, but much more gradually than in the case of *Phormia*. Thus, larvae of *Calliphora* reached maturity in 10 days at 15°C. [59°F.], but those of *Phormia* required the same time to mature at 19·5°C. [67·1°F.]. A rise of temperature above the optimum also retarded development, but the larvae developed in 5½ days at 35°C. [95°F.]. The optimum temperatures for the development of the larvae and for increase in their weight did not coincide in the case of *Calliphora*, the highest mean weight being reached at 22°C. [71·6°F.].

[OKUNEVSKIĬ (Ya. L.) & KHAKHAEVA (V. V.).] **Окуневский (Я. Л.) и Хахаева (В. В.). L'effet désinsectant de certains produits chimiques sur les punaises.** [*In Russian.*]—*Med. Parasitol.* **3** no. 5 pp. 406–414, 3 refs. Moscow, 1934. (With a Summary in French.)

In the course of investigations on the volatility of various chemicals [*R.A.E.*, B **22** 194], experiments were carried out to test their toxicity to bed-bugs [*Cimex lectularius*, L.], either by submerging or by fumigating them. The results of the tests are shown in tables. When the bugs were submerged, the most toxic substances were those that had a low volatility and a slow rate of evaporation ; kerosene, fusel oil (amyl alcohol) and isoamyl alcohol killed all the insects in 10 seconds, turpentine and xylol in 60 seconds, and the highly volatile benzine, carbon tetrachloride and methyl alcohol in 2, 3 and 15 minutes respectively.

In fumigation tests [in which the quantities of each material are here expressed as fl. oz. per 10 cu. ft.] the reverse was the case. At 24–25°C. [75·2–77°F.], all the bugs were killed by 3 oz. carbon tetrachloride in 1½ hours, by 6 oz. benzine or methyl alcohol in 2 hours and by 20 oz. xylol in 2½ hours, whereas 25 oz. turpentine and 20 oz. fusel oil

only killed 60 and 50 per cent., respectively, in 2½ hours, and 20 oz. isoamyl alcohol and 20 oz. kerosene, applied for 2 hours and 2⅔ hours, respectively, only rendered the bugs immobile for a short time. The effect of all substances increased sharply with the rise of temperature and an even distribution of the vapours in the fumigation chamber. At 28–32°C. [82·4–89·6°F.], 3 oz. carbon tetrachloride killed all the bugs in 30 minutes.

All the highly volatile substances tested, as well as solvent naphtha (the crude material from which xylol is obtained), may be successfully used for fumigating clothes and furniture infested with bugs, as they do not damage fur, leather or fabrics ; fumigation should be carried out at a temperature of 60°C. (140°F.] and should last for 30–60 minutes. In previous experiments solvent naphtha killed 80 per cent. of submerged bugs in 7 seconds and all in 20. In fumigation tests, 20 oz. destroyed 90 per cent. of the bugs in 2 hours at 22°C. [71·6°F.] and all in 30 minutes at 28–32°C. Mixing solvent naphtha with benzine in the proportion of 1 : 3 increases its volatility and so helps the vapour to saturate the air more quickly.

[Beklemishev (V.), Vinogradskaya (O.) & Mitrofanova (Yu.).] **Беклемишев (В.), Виноградская (О.) и Митрофанова (Ю.). Sur le cycle gonotrophique d'*Anopheles*.** [*In Russian.*]—*Med. Parasitol.* **3** no. 6 pp. 460–479, 5 graphs. Moscow, 1934. (With a Summary in French.) [Recd. February 1935.]

A detailed account is given of laboratory investigations carried out in the summer of 1933 in southern Kazakstan and near Moscow on the gonotrophic cycle in females of *Anopheles*, which the authors define as a periodically repeated conjunction of parallel processes of digestion of blood and maturation of eggs. Of the females examined in Kazakstan, 647 were *Anopheles pulcherrimus*, Theo., 435 *A. sacharovi*, Favr, which is here regarded as a race of *A. maculipennis*, Mg., and 35 *A. hyrcanus*, Pall. ; 1,481 females of *A. maculipennis messeae*, Flni., were taken and dissected near Moscow. In all four forms there exists in the summer a strict correlation between the development of the ovaries and blood digestion, complete development of the ovaries being possible after one blood meal. The rapidity with which the ovaries develop under conditions of gonotrophic concordance may be divided into three categories, of which norm 1 represents the maximum rapidity of the ovarian development of the multiparae alone, norm 2 the maximum rapidity in the case of primiparae, and norm 3 the minimum rapidity of the primiparae, which, however, ensures a complete development of the ovaries after a single blood meal. At the beginning of each gonotrophic cycle, the ovaries of all primiparae develop according to norm 2, and those of all multiparae according to norm 1. Later, however, some of the multiparae may be classified under norm 2, and some of the primiparae pass into norm 3. The proportion of females that develop according to norms 1 and 3 depends on species and season ; thus, the percentage of females that may be classified under norm 1 is higher in summer than in autumn, and also higher among *A. pulcherrimus* and *A. hyrcanus*, and the converse is true of norm 3.

In the course of the summer, 1–2 per cent. of mosquitos of all four species show a retardation of ovarian development, which is probably

due to insufficient ingestion of blood, or sometimes to partial gonotrophic dissociation caused by excessive rise or fall of temperature [*cf. R.A.E.* B **22** 77].

In the autumn, such partial gonotrophic dissociation in *A. pulcherrimus*, *A. sacharovi* and *A. m. messeae* occurs somewhat more often than in the summer, though complete gonotrophic dissociation also takes place.

Investigations on the correlation between the presence of fat-body and the rapidity of ovarian development showed that no correlation exists in the summer; in July and August 4–5 per cent. of *A. m. messeae*, *A. sacharovi* and *A. pulcherrimus* have a partly or well-developed fat-body. In September, as many as 50–60 per cent. of the females of the last two possess a fat-body, though there is complete gonotrophic concordance; the percentage of females of the race *messeae* with a fat-body in the presence of gonotrophic concordance is considerably lower. In the case of *A. pulcherrimus* there is no correlation between the presence of the fat-body and the rapidity of ovarian development even in September, since the number of females containing a fat-body does not increase as egg maturation becomes slower; on the other hand, in the case of *A. sacharovi* the number of females with fully or partly formed fat-body increases rapidly as the maturation of the ovaries is retarded. The connection between the presence of the fat-body and a complete gonotrophic dissociation is particularly manifested in the race *messeae*. These facts indicate that the ingestion of blood is not inimical to the development of the fat-body, and that in most cases, on the contrary, the fat-body accumulates at the expense of the digested blood.

In Central Asia, *A. pulcherrimus* hibernates as a larva, but though the females die in autumn, they undergo autumn gonotrophic dissociation and form a fat-body, as do Anophelines that hibernate as adults.

[VINOGRADSKAYA (O. N.) & SHMELEVA (Yu. D.).] **Виноградская (О. Н.) и Шмелева (Ю. Д.). La circulation des** *A. maculip. messeae* **Fall. aux abris, habités par leur proie (observations à Sopowo, près de Moscou).** [*In Russian.*]—*Med. Parasitol.* **3** no. 6 pp. 480–488, 9 refs. Moscow, 1934. (With a Summary in French.) [Recd. February 1935.]

An account is given of the results of daily catches of Anophelines made in huts and two cow-sheds in July–August 1933 near Moscow where turf-pits are numerous and *Anopheles maculipennis messeae*, Flni., is predominant [*R.A.E.*, B **23** 108]. Only a negligible number of males entered the huts or one of the cow-sheds. The percentage of females that entered unfed was only slightly lower than that of females that left with digested blood and matured eggs. In the case of individuals in the intermediate stages of the gonotrophic cycle, the number of those that entered was equal to the number of those that left the shelters. The percentage of females that abandoned the huts unfed was twice as high as that of those that left the cow-shed.

Of the mosquitos taken during the day in the other cow-shed, which was nearer the breeding-places, 11·6 per cent. were males. Of the females 3·2 per cent. had not fed and 9·6 per cent. had almost completed the digestion of blood and maturation of eggs.

Hourly catches in a cow-shed for five consecutive nights showed that almost all the mosquitos came in during the first two hours after sunset

and the hour preceding sunrise. Unfed females were predominant. Mosquitos leaving the shelter were mostly females with digested or nearly digested blood and mature ovaries. The exit from the shelter began during the hour preceding sunset and lasted until 2–3 hours after. No mosquitos went out during the night and only a few just before sunrise.

[RAEVSKIĬ (G. E.) & VINOGRADSKAYA (O. N.).] **Раевский (Г. Е.) и Виноградская (О. Н.). Natural Conditions favouring the Spread of Malaria and the Fauna of the Family Culicidae in the Valley of the River Chu in the Kirghiz Autonomous Soviet Socialistic Republic.** [*In Russian.*]—*Med. Parasitol.* **3** no. 6 pp. 489–499, 8 refs. Moscow, 1934. [Recd. February 1935.]

This paper deals with observations in August–December 1932 on mosquitos and malaria in two districts in the north of the Kirghiz Republic, one of which is situated in the valley of the river Chu and the other at the foot of the mountain range near Frunze. The Anophelines found were *Anopheles maculipennis messeae*, Flni., *A. hyrcanus* var. *pseudopictus*, Grassi, *A. hyrcanus hyrcanus*, Pall., and *A. claviger*, Mg. (*bifurcatus*, auct.). The first two were the commonest. The larvae of *messeae* were present in practically all types of water in both districts ; those of *A. hyrcanus*, and especially var. *pseudopictus*, which were confined to the valley of the river Chu, usually occurred in accumulations of water from irrigation ditches and in flooded meadows ; and larvae of *A. bifurcatus* were found at the foot of the mountain range in accumulations of water fed by springs, and in the valley of the Chu in swamps formed by water from irrigation channels, provided that it was cold.

In 1932, the adults of *messeae* left their hibernation quarters about mid-March, and entered them in the first half of October. Larvae were present from April to October. Hibernation occurred in unheated places, where no hosts were available, and as the temperature in December–February is below freezing point, blood ingestion during winter is hardly possible. The first females with fat-bodies were found on 11th September, and 8 days later most of the females had them.

Benign tertian [*Plasmodium vivax*] constitutes 50–92 per cent. of all cases of malaria. Quartan [*P. malariae*] is rare, and malignant tertian [*P. falciparum*] begins in August and reaches its peak in September–October, when it constitutes as much as 50 per cent. of cases in some localities. The malaria incidence averaged 25·5 per cent. but was closely correlated with the proximity of flooded areas.

[SERGIEV (P. G.).] **Сергиев (П. Г.). The *Phlebotomus* of Daghestan and North Caucasus.** [*In Russian.*]—*Med. Parasitol.* **3** no. 6 pp. 499–501. Moscow, 1934. [Recd. February 1935.]

This is the first record of *Phlebotomus* spp. from Daghestan. Species taken between September 1929 and September 1933 were *Phlebotomus papatasii*, Scop., which was the most common of all throughout the summer ; *P. major*, Annan., and *P. kandelakii*, Shchur., both of which occurred in approximately equal numbers at the end of June and beginning of July and apparently disappeared towards September ; and *P. sergenti*, Parr., and *P. caucasicus*, Marz., which were rare. A single female of *P. major* was also captured in the North Caucasus

near the town of Armavir situated at 45° N. Lat., the northernmost point in the Russian Union at which sandflies have been found.

A table shows the dates of capture, the number of individuals taken, and the local distribution of the sandflies in Daghestan.

[SHIPITZUINA (N. K.).] **Шипицына (Н. К.). Les types des abris d'*Anopheles maculipennis*, observés dans la plaine littorale de Daguestane (Caucase).** [*In Russian.*]—*Med. Parasitol.* **3** no. 6 pp. 501–516, 15 refs. Moscow, 1934. (With a Summary in French.) [Recd. February 1935.]

In investigations during August and September 1933 in a district along the Caspian Sea south of the town of Makhach-Kala in Daghestan, the collected adults of *Anopheles sacharovi*, Favr, which was predominant, *A. maculipennis*, Mg., *A. maculipennis messeae*, Flni., *A. hyrcanus* var. *pseudopictus*, Grassi, and *A. superpictus*, Grassi, which was rare, were classified according to sex and stages of blood-digestion. As a result of this analysis, the resting places were classified as feeding places, shelters used for one day, and shelters used for several days. Of the mosquitos collected in feeding places, which consisted of inhabited huts and animal quarters (chiefly cow-sheds), about 1·2 per cent. were males, 5·9 unengorged females, 21·3 had fed the preceding night, 28 contained half-digested blood, and 43·9 had fully or nearly fully developed ovaries. The percentages of unfed females in dwellings and in animal quarters were 8 and 4·7 respectively.

In shelters used for one day, which comprised latrines, cellars and corridors of station buildings, 37·3 per cent. of all mosquitos were males ; 42·3 per cent. of the females had not fed, and of these 72·5 per cent. were freshly emerged. Females containing blood and those with matured eggs represented 31·1 per cent. of the total number of mosquitos ; those with fresh blood constituted 8·7 per cent. of the total number of females. In September, a fat-body occurred in 6·1 per cent. of the females in shelters, as compared with only 0·5 per cent. of those in feeding places.

Shelters used for several days were of the same type as the one-day resting places with the addition of uninhabited dwellings. Of the Anophelines in them 98 per cent. were females, and of these 9·3 per cent. contained fresh blood, and 66·6 per cent. mature or almost mature eggs.

Most of the resting places had a fairly stable relative humidity of 65–87 per cent. ; a few that were more open and had a minimum relative humidity of 48–60 per cent. harboured fewer mosquitos. A constant difference in the microclimate of the three types of shelters could not be definitely established, and the character of the Anopheline population in them was found to depend chiefly on the presence or absence of a host and the situation and accessibility of the shelter.

Of the mosquitos caught while entering dwellings, 7·5 per cent. were males, 55 unengorged females, 13·7 contained fresh blood and 23·7 digested blood or mature eggs. Observations on one night showed that unfed females entered during the first two hours after sunset, whereas the males and females that sought shelter did so during the second part of the night. They went out during the hour after sunset ; 18·4 per cent. of the mosquitos were males, 62·7 per cent. females ready or almost ready to oviposit, 17·9 per cent. females that had not fed, and 1 per cent. were in intermediary stages of the gonotrophic cycle. As a

comparatively large number of females (23·7 per cent.) entered dwellings with half digested blood, and only a negligible number (1 per cent.) of such females left the houses, it is apparent that the former did not migrate from other houses; probably digestion was begun in the field among vegetation after feeding in the open, but the somewhat unfavourable microclimate of these natural resting places compelled the mosquitos to seek shelter in inhabited buildings.

CORRADETTI (A.). **Ricerche sugli incroci tra le varietà di** *Anopheles maculipennis.* [Researches on Crosses between the Varieties of *A. maculipennis.*]—*Riv. Malariol.* **13** (1934) no. 6 pp. 707–720, 1 pl., 8 refs. Rome, 1935. (With a Summary in English.)

In continuation of research in Italy on races of *Anopheles maculipennis*, Mg. [*R.A.E.*, B **22** 137, 257] and in reference to the work of others [**22** 138, 198], the author has attempted to discover the results of crosses between *A. sacharovi*, Favr (*elutus*, Edw.), which he here regards as a race of *maculipennis*, *maculipennis* (*typicus*) and *messeae*, Flni., with the Italian *atroparvus*, van Thiel, and to compare them with the results of crosses with the Netherlands *atroparvus*.

In the first series of experiments, the males of the Italian *atroparvus* behaved like those in Holland [**22** 199], for in captivity they produced crosses with the females of the other races, which could not be fertilised in captivity by the males of their own species. Females of *atroparvus* were not fertilised by males of the other races. The hybrid males were invariably sterile. Females of the first hybrid generation resulting from typical *maculipennis* were sterile, but those resulting from *messeae* produced eggs when fertilised by males of *atroparvus*.

In the second series of experiments the author studied the crosses and re-crosses between females of *labranchiae*, Flni., and males of *atroparvus* in successive generations, with particular reference to the Mendelian characters of the eggs. It was found that the eggs laid by the F_1 generation have characters intermediate between *labranchiae* and *atroparvus*. These characters are distributed according to the Mendelian law, *i.e.*, 75 per cent. for the dominant (*atroparvus*) and 25 for the recessive (*labranchiae*). The different sets of characters in the eggs occurred independently of each other. It was not established whether F_1 is eurygamic or stenogamic; no fertile eggs were obtained in inter-breeding of the males and females of the F_1 generation, in which only 10 per cent. of the males had apparently normal genitalia. In the second generation, obtained by recrossing the hybrid female with the *atroparvus* male, the stenogamic character was dominant and interbreeding was possible; the eggs deposited were fertile and developed normally.

The results of the Dutch authors and of Roubaud on the possibility of crosses between *atroparvus* females and *labranchiae* males were confirmed.

GIOSEFFI (M.). **Malaria e lotta antimalarica in Istria nel periodo 1° novembre 1932 – 31 ottobre 1933.** [Malaria and anti-malarial Work in Istria from 1st November 1932 to 31st October 1933.]—*Riv. Malariol.* **13** (1934) no. 6 pp. 734–806. Rome, 1935.

A detailed account is given of malaria and measures against it in Istria during 1932–1933. In the Quieto district, where an outbreak

occurred in 1932, *Anopheles maculipennis messeae*, Flni., was usually found, but *A. sacharovi*, Favr (*elutus*, Edw.) was observed in some isolated dwellings. The measures taken, which included screening and the use of an anti-mosquito spray, reduced the incidence of malaria from 3 per cent. in 1932 to 2·3 in 1933. In the district of the Arsa all waters in the bed of the almost empty lake were stocked with *Gambusia*, Paris green was applied weekly to breeding places found to contain Anopheline larvae, and adults were captured in the stables.

Davis (N. C.). **An Investigation of Possible Vectors of** *Wuchereria bancrofti* **(Cobbold) in Bahia, Brazil.**—*J. Parasit.* **21** no. 1 pp. 21–26, 10 refs. Baltimore, Md, February 1935.

Experiments were carried out between October 1932 and April 1933 at São Salvador, Bahia, to determine the susceptibility of local mosquitos to infection with *Filaria* (*Wuchereria*) *bancrofti*. The females used were all bred from larvae with the exception of those of *Mansonia juxtamansonia*, Chagas, which were caught as adults in an uninhabited marsh about 4 miles outside the city. The mosquitos were fed on a case of filariasis at about 10 p.m. and subsequently dissected at varying intervals. Proboscis infections were observed in *Culex fatigans*, Wied., 12 days after the infecting feed, and in *Mansonia juxtamansonia* and *Anopheles* (*Nyssorhynchus*) *albitarsis*, Arrib., 15 days after. Advanced development of filarial larvae took place occasionally in *A.* (*N.*) *bachmanni*, Petrocchi, and in *Culex nigripalpus*, Theo. Retarded development was observed in one example of *A.* (*N.*) *tarsimaculatus*, Goeldi. Slight development, followed by degeneration occurred in *Aëdes aegypti*, L., and *A. fluviatilis*, Lutz., but no development was noted in *A. taeniorhynchus*, Wied., or *A. scapularis*, Rond. Invasion of the thorax occurred once in the former but never in the latter. Anophelines of the *Nyssorhynchus* group should be considered as probable vectors, although the chief vector in Bahia is undoubtedly *C. fatigans*.

Hu (S. M. K.). **Experimental Infection of** *Culex fatigans* **Wiedmann from Foochow, Fukien Province with** *Wuchereria bancrofti* **Cobbold.**—*Lingnan Sci. J.* **14** no. 1 pp. 87–92, 10 refs. Canton, 1st January 1935.

Females reared in Shanghai from larvae and pupae of *Culex fatigans*, Wied., collected during March 1934 at Foochow, where filariasis occurs, were allowed to feed for an hour at 9 p.m. on a patient with numerous microfilariae of *Filaria* (*Wuchereria*) *bancrofti* in his blood. The engorged individuals were subsequently isolated in screened lamp chimneys with pads of moist cellu-cotton and soaked raisins and kept for a period long enough to allow infective forms of the parasite to mature. From the dissection at various intervals of the ones that died, it was found that in spring this period was about 23 days. Of 193 females that engorged, 70 per cent. harboured filarial larvae; some contained living larvae, others dead and living larvae, and others dead larvae only. Of 141 females that survived the incubation period of the parasite, 68 per cent. harboured active filarial larvae that had reached the infective stage. In females harbouring only living infective larvae, the average number was about 6·7 per mosquito.

Bos (A.). **Beitrag zur Kenntnis der Geflügelpockenübertragung durch Mücken und andere Arthropoden.** [The Transmission of Fowl Pox by Mosquitos and other Arthropods.]—*Z. InfektKr. Haustiere* **46** no. 3 pp. 195–259, 1 fig., 2 pls., 1 p. refs. Berlin, 1934.

The literature on the transmission of fowl pox by Arthropods is briefly reviewed, and a very detailed account is given of 119 experiments at Utrecht on such transmission [*cf.* *R.A.E.*, B **20** 106, 149, etc.].

The following is taken from the author's summary : In a preliminary experiment healthy fowls were readily infected by mere contact with infected ones. In 38 out of 56 transmission experiments with mosquitos, all the four species tested transmitted the infection by biting. *Culex pipiens*, L., did so up to 75 days after feeding on an infected fowl, *Aëdes aegypti*, L. (*argenteus*, Poir) up to 15 days, *Theobaldia annulata*, Schr., up to 70, and *Anopheles maculipennis*, Mg., up to 210. Mosquitos that have acquired infection before hibernation can therefore transmit it in the following spring. For up to about 50 days practically every bite produced infection. Infected mosquitos were able to infect at least three birds, even at long intervals. Transmission from mosquito to mosquito by heredity or during mating did not occur. In further experiments with *C. pipiens* and *A. maculipennis*, the virus was found in or on the whole mosquito except the wings. The proboscis remained infected from the time of feeding up to 185 days, and was the only infected part after 110 days. It is concluded that no development of the virus occurs in the mosquito and that transmission by it is purely mechanical.

Stomoxys calcitrans, L., *Cimex lectularius*, L., *Argas persicus*, Oken, and *Ornithodorus moubata*, Murr., transmitted the virus, but did not retain it so long as the mosquitos. *Dermanyssus gallinae*, DeG. (*avium*, Dug.) and Mallophaga failed to transmit it.

The conclusion is that the importance of Arthropods in the natural spread of the disease is small.

[Rubtzov (I. A.) & Vlasov (N. A.).] **Рубцов (И. А.) и Власов (Н. А.) An Experiment on applying Emulsions for the Control of Black Flies.** [*In Russian.*]—*Arb. ost-Sibir. StUniv.* **2** pp. 51–79, 46 refs. Moscow, 1934. (With a Summary in English.)

A detailed account is given of experiments carried out in eastern Siberia on the use of larvicides for the control of Simuliids, the adults of which cause losses among cattle and annoyance to man. The chief species dealt with was *Simulium ornatum*, Mg., though some work was also done on *S. morsitans*, Edw., *S. latipes*, Mg., *S. venustum*, Say, and others. Over 80 different emulsions were tested, but special attention was devoted to 9 petroleum oils, as these, when prepared by mixing in soap dissolved in carbolic acid or creosol, showed a high ability to mix with water.

The larvae on which the tests were made were placed, with the plants to which they were attached, in glass cylinders covered at each end with muslin and immersed in the diluted emulsion for varying periods. After this the cylinders and their contents were washed in running water and placed in the river at the spot from which the larvae had originally been taken. After 24 hours the dead larvae were counted. The comparative toxicity of the various oils tested is discussed in detail and shown in tables. Heavy mineral oils were far less toxic than light ones. The highest toxicity was shown by xylol, which killed

all larvae of the fourth and fifth instars in concentrations of 1 part to 200 parts water at a water temperature of 11°C. [51·8°F.] in 3–3·5 minutes. Kerosene was effective only in concentrations not lower than 1 : 100. At this concentration it killed all third and fourth instar larvae in 3 minutes at 8·2°C. [46·7°F.], whereas a concentration of 1 : 200 only killed 73–86 per cent. A rise in water temperature increased the toxicity of the emulsions ; kerosene showed a sharp drop in toxicity at about 0°C. [32°F.] and a sharp rise at above 15°C. [59°F.]. The resistance of the larvae increased with age, those about to pupate and the pupae themselves being the most difficult to destroy. Eggs submerged for 3 minutes in a kerosene emulsion, 1 : 100, at 18–20°C. [64·4–68°F.] did not hatch, but in natural conditions most of the eggs in treated water were unaffected.

In addition to the tests with oil emulsions, laboratory tests were carried out with nicotine, calcium arsenite, Paris green, sodium fluoride and sodium fluosilicate. Paris green in concentrations of 1 : 1,000 killed all larvae in 5 minutes ; the other substances at this concentration were much less toxic. Extracts of local pyrethrum were ineffective.

Kerosene was tested under natural conditions in two small rivers. The emulsions were poured into the river, and the water was slightly stirred to spread them. The quantity of emulsion necessary to treat a stretch of river 50 metres [164 ft.] in length was calculated by means of a formula, which is given. To keep the concentration up to 1 : 100, it was necessary to add half the initial amount of emulsion to every 40–50 metres of the flowing water as it passed. If the vegetation in the river was very dense, it absorbed much of the emulsion, so that a far greater quantity had to be applied. Satisfactory results obtained by treating stretches of water 50–100 metres long with various emulsions are discussed in detail ; heavy oils again proved to be considerably less effective than light ones. Since the eggs are not killed, it is suggested that, to secure complete control, treatment should be repeated 2 or 3 times during the summer at intervals of 10–15 days.

Campbell (F. L.), Sullivan (W. N.), Smith (L. E.) & Haller (H. L.). **Insecticidal Tests of Synthetic Organic Compounds—chiefly Tests of Sulfur Compounds against Culicine Mosquito Larvae.**—*J. econ. Ent.* **27** no. 6 pp. 1176–1185, 5 refs. Geneva, N.Y., December 1934.

The discovery that certain types of aliphatic sulphur compounds, expecially thiocyanates, isothiocyanates, mercaptans and bisulphides, had insecticidal properties led to the preparation of organic sulphur compounds of various other types. These and certain synthetic organic compounds not containing sulphur were tested in 1932 against the larvae of *Culex* spp.

The following is substantially the authors' summary of the results, which they think may prove valuable in the search for insecticides that can be used instead of lead arsenate : Of 68 synthetic organic compounds, 24 were found to equal or exceed nicotine in toxicity. In previous work nicotine at 1 : 10,000 killed 65 per cent. of Culicine larvae in 8 hours. Diphenylene oxide and diphenylene sulphide, the most effective of these compounds, killed nearly all the larvae in 5 hours at 1 : 200,000. In the course of the work two new compounds were prepared, p-hydroxyphenylacetimido-thiophenylether hydrochloride

and phenylacetimido-thio-p-tolylether hydrochloride. The latter was probably the most toxic of the seven thioethers that were tested. It was effective against mosquito larvae at 1 : 100,000.

An addendum states that tests of organic sulphur compounds continued by J. W. Bulger and D. E. Fink have shown that the compound most toxic to Culicine larvae (November 1934) is thiodiphenylamine (phenothiazine), which is more toxic than rotenone, being very effective at a concentration of 1 : 1,000,000.

NETTLES (W. C.). **An unusual Outbreak of Stable Fly and its Control.**—*J. econ. Ent.* **27** no. 6 pp. 1197–1198. Geneva, N.Y., December 1934.

A survey of the neighbourhood of a sewage disposal plant in South Carolina, where a very severe outbreak of *Stomoxys calcitrans*, L., was in progress, showed that it was breeding in the trickling sewage filters, a type of breeding place never before recorded. A survey of 13 southern States failed to reveal any similar infestation. Chemicals could not be used because they might affect the nitrifying bacteria in the filters, and the cost of screening would have been excessive. An emergence of 80 per cent. followed an attempt to destroy the pupae by flooding for 24 hours, but all larvae were killed by submergence for this time. Subsequently submerging the filters for 12 hours twice a week for a month reduced the flies to numbers at which they ceased to be troublesome, without affecting the bacteria.

PAPERS NOTICED BY TITLE ONLY.

RIPSTEIN (C.). **Los mosquitos del Valle de Mexico. I.** *Theobaldia maccrackenae dugesi* **D. y K.**—*An. Inst. Biol. Mex.* **5** no. 3 pp. 249–257, 9 figs., 4 refs. Mexico, 1934. [Recd. February 1935.]

COVELL (G.). **Anti-mosquito Measures with Special Reference to India.** *Hlth Bull.* no. 11 (*Malar. Bur.* no. 3) 3rd edn (revd) 61 pp. Delhi, Manager of Publications, 1934. Price 1*s*. 3*d*. [*Cf. R.A.E.*, B **15** 144.]

MOCHTAR (Raden). **De mannelijke imago van** *A. gigas* **variëteit van Danau-Bento.** [The Male Adult of an unnamed Variety of *Anopheles gigas*, Giles, from Danau-Bento, West Coast of Sumatra.] —*Geneesk. Tijdschr. Ned.-Ind.* **75** no. 1 pp. 39–40, 1 pl. Batavia, 8th January 1935. [*Cf. R.A.E.*, B **22** 208.]

PUNTONI (V.). **Azione delle acque di fogna sullo sviluppo delle larve anofeline.** [The Action of Sewage Water on the Development of Larvae of *Anopheles maculipennis*, Mg., in Italy.]—*Riv. Malariol.* **13** (1934) no. 6 pp. 721–733. Rome, 1935. (With a Summary in French.) [*Cf. R.A.E.*, B **22** 133.]

LI (Feng-swen) & WU (Shih-cheng). **On the Known Species of Chinese** *Aëdes* **(Diptera, Culicidae).** [*In Chinese.*]—*Ent. & Phytopath* **2** no. 35 pp. 682–688, 1 fig., 3 pp. refs. Hangchow, 11th December 1934.

SINTON (J. A.). **Instructions for Collecting and Forwarding Mosquitos.** —*Hlth Bull.* no. 13 (*Malar. Bur.* no. 5) 2nd edn (revd & enl.), 70 pp., 2 pls., many refs. Delhi, Manager of Publications, 1934. Price 1*s*. 3*d*.

Li (Feng-swen) & Wu (Shih-cheng). **The Methods of Collecting, Mounting and Mailing of Mosquitos.** [*In Chinese.*]—*Ent. & Phytopath.* **2** no. 22 pp. 430–437, 6 figs. Hangchow, 1st August 1934. (Abstr. in English in *Lingnan Sci. J.* **14** no. 1 p. 205. Canton, 1st January 1935.)

Knowlton (G. F.) & Rowe (J. A.). **New Blood-sucking Flies from Utah (Simuliidae, Diptera).**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 580–584, 10 figs. Columbus, Ohio, December 1934.

Donat Wood (F.). **Experimental Studies on** *Trypanosoma cruzi* **in California.**—*Proc. Soc. exp. Biol. Med.* **32** no. 1 pp. 61–62, 2 refs. New York, October 1934. [*Cf. R.A.E.*, B **23** 40.]

Meleney (H. E.) & Harwood (P. D.). **Human Intestinal Myiasis due to the Larvae of the Soldier Fly,** *Hermetia illucens* **Linné (Diptera, Stratiomyidae)** [in Tennessee].—*Amer. J. trop. Med.* **15** no. 1 pp. 45–49, 2 figs., 3 refs. Baltimore, Md, January 1935.

Scheerpeltz (O.). **Zwei neue Arten der Gattung** *Aleochara* **Gravh. (Coleopt. Staphylinidae), die aus den Puppen von** *Lyperosia* **(Dipt.) als Parasiten gezogen wurden.** [Two new Species of *Aleochara* (*A. handschini* from Java and Flores, and *A. windredi* from N. Australia) bred from the Pupae of *Lyperosia exigua*, de Meij.]—*Rev. suisse Zool.* **41** no. 6 pp. 131–147, 3 figs. Geneva, February 1934. [*Cf. R.A.E.*, B **23** 66.]

Wigglesworth (V. B.). **The Physiology of Ecdysis in** *Rhodnius prolixus* **(Hemiptera). II. Factors controlling Moulting and "Metamorphosis."**—*Quart. J. micr. Sci.* **77** pt. 2 pp. 191–222, 1 pl., 15 figs., 24 refs. London, December 1934. [*Cf. R.A.E.*, B **21** 285.]

Thor (S.). **Uebersicht und Einteilung der Familie Trombidiidae W. E. Leech 1814 in Unterfamilien.** [Revision and Division into Subfamilies of the Family Trombidiidae.]—*Zool. Anz.* **109** no. 5–6 pp. 107–112, 1 ref. Leipzig, 1st February 1935.

Kéler (S.). **Mallophaga von Polen. Die Familie Trichodectidae.** [The Trichodectidae of Poland.]—*Bull. int. Acad. Cracovie* B II no. 5–7 pp. 259–267, 2 pls., 21 refs. Cracow, 1934.

Maschke (K.). **Parasiten der Wirbeltiere des Glatzer Schneeberges. ii. Flöhe von Kleinsäugern des Glatzer Schneeberges.** [Parasites of the Vertebrates of the Glatz Schneeberg. ii. Fleas of the small Mammals of the Glatz Schneeberg.]—*Beitr. Biol. Glatzer Schneeberges* **1** pp. 86–88, 6 refs. Breslau, 12th January 1935.

Kemper (H.). **Ueber Gliederfüssler als Gesundheitsschädlinge im Altertum.** [On Arthropods as Pests of Health in Antiquity (records from ancient civilisations).]—*Z. GesundhTech. Städtehyg.* **26** nos. 10, 11–12 pp. 547–554, 613–628, 2 pp. refs. Berlin, 1934.

Thompson (G. B.). **The Parasites of British Birds and Mammals. III.—On some Parasites Living in the Nest of the House Martin** (*Chelidon u. urbica* **Linn.**).—*Ent. mon. Mag.* **71** nos. 849–850, pp. 46–50, 7 refs. London, February–March 1935.

CORSON (J. F.). **Further Observations on Francolin and Guinea-fowl as Reservoirs of** *Trypanosoma rhodesiense.*—*J. trop. Med. Hyg.* **38** no. 4 pp. 46–47, 4 refs. London, 15th February 1935.

In experiments in Tanganyika Territory, 11 examples of *Glossina morsitans*, Westw., infected with a strain of *Trypanosoma rhodesiense* (originally isolated from man) were allowed to bite 19 francolins and 9 guinea-fowl, and 3 birds of each kind were subsequently shown by inoculation of blood into rats to have been infected. One francolin remained infective for 3 months and one guinea-fowl for 18 days but not for 2 months. Several hundred laboratory-bred flies were fed on the infected birds, but the infection was not transmitted. No infection resulted when the blood of 67 guinea-fowls caught in a sleeping sickness area where tsetse flies are abundant was inoculated into rats. It is concluded from these results and from those of previous work [*R.A.E.*, B **19** 232; **20** 124] that these two birds, like the domestic fowl, need not be considered, at most, as more than very rare and temporary reservoirs of *T. rhodesiense.* Moreover, in nature the proportion of avian to mammalian blood in *G. morsitans* is small.

ADLER (S.) & THEODOR (O.). **Investigations on Mediterranean Kala Azar. VII.—Further Observations on Canine Visceral Leishmaniasis.**—*Proc. roy. Soc.* (B) **116** no. 801 pp. 494–504, 2 pls., 9 refs. London, February 1935. **VIII.—Further Observations on Mediterranean Sandflies.**—*T.c.* pp. 505–515, 2 figs., 8 refs. **IX.—Feeding Experiments with** *Phlebotomus perniciosus* **and other Species on Animals infected with** *Leishmania infantum.*—*T.c.* pp. 516–542, 4 refs. **X.—A Note on** *Trypanosoma platydactyli* **and** *Leishmania tarentolae.*—*T.c.* pp. 543–544, 1 ref.

In the course of further investigations on canine visceral leishmaniasis [*cf. R.A.E.*, B **20** 159], 19 out of 188 dogs examined in Malta between May and the end of November 1932 were found to be infected. As the number of dogs on the Island is estimated at 15,000, it would appear that during the summer months at least 1,500 are capable of infecting sandflies. This number is underestimated, for the parasites in the spleen of an infected dog may be so few that they are overlooked even after prolonged examination of smears and yet sandflies fed on the same animal become infected. Moreover, histological examination of the skin fails to reveal the infection in some animals, although 20 per cent. of the sandflies (*Phlebotomus perniciosus*, Newst.) allowed to engorge on them become infected. Fully 60 per cent. of the infected animals appeared to be well nourished and in good health. In some animals the intensity of infection (number of parasites) bears no relation to clinical condition or to histological findings, which are described in detail in two dogs that died of experimental infection. The infection of unbroken skin is the deciding factor in the propagation of the flagellates in sandflies, for sandflies that feed in skin that is ulcerated and contaminated by secondary infections ingest bacteria and die in a few days. The unbroken skin is infected in all naturally infected animals and in animals inoculated intrahepatically. Infection of the eyes, mouth, nasal mucosa and urinary passages may be such as to render the escape of parasites through discharges inevitable, but this is not regarded as of importance in the spread of the disease, which occurs only where there are sandflies of the group of *Phlebotomus major*, Ann.

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The sandflies found in Malta during 1931 and 1932 were *Phlebotomus perniciosus*, *P. papatasii*, Scop., *P. parroti*, Adl. & Thdr. (formerly recorded as *P. minutus*, Rond. [**1** 27]), *P. major*, *P. sergenti*, Parr., and *P. macedonicus*, Adl. & Thdr., which was found only on the Island of Gozo. The last three species, which are recorded for the first time from Malta, are not sufficiently numerous to be of importance in the transmission of kala-azar. *P. perniciosus* is by far the most prevalent species both in Malta and Gozo, being at least twenty times as numerous as *P. papatasii*, although it has attracted less attention because it is not found in large numbers in dwellings during the daytime. In Malta it occurs in the adult stage from about the beginning of May until November. It is ubiquitous, but there are certain streets in which conditions for breeding are particularly favourable, apparently owing to the large amount of moisture near public water taps, moist cellars, drains and gutters, from which sandflies were seen to emerge. As this sandfly and kala-azar are almost uniformly distributed, it was not possible to correlate the two, but cases of the disease were much more frequent in areas of dense infestation. *P. perniciosus* appears to live in the open far more than was previously supposed; it often does not enter houses at all, but feeds on dogs and man in the street and then disappears in cracks near the bottom of walls. In nature it feeds far more readily on cows and dogs than on man [*cf.* **19** 218]. Laboratory-bred individuals fed so seldom on man or hamsters [*Cricetulus* and *Cricetus*] that most experiments were carried out with unfed wild females, which were easily captured in large numbers. It was found possible to distinguish newly emerged unfed females from those that had fed once and laid eggs prior to feeding a second time, because the sebaceous (accessory ovarial) glands in the former are empty whereas those of the latter contain granules. Egg development depends on fertilisation and a blood meal; the rate in a fertilised fully-fed female depends on temperature; at 27°C. [80·6°F.] the eggs are mature in 4–5 days and at 30°C. [86°F.] in 3–4 days. The method of feeding sandflies in the laboratory and the technique used in breeding are described. From further observations on hibernation, it appears that it begins in August in spite of a mean temperature of 27–28°C. [80·6–82·4°F.], at which there is normal development in the earlier generations, and is most marked between September and November, even if the same comparatively high temperature is maintained. There is practically no active development below 21°C. [69·8°F.], and larvae kept at this temperature for 10 days remained inactive when the temperature was raised to 25·5°C. [77·9°F.] for 6 days. A relatively small number of larvae do not hibernate even at low temperatures, a fact that explains the finding of isolated sandflies in December.

Additional observations on *P. perniciosus* in Catania (Sicily) were made in August and September 1931 and from July to November 1932. Its prevalence had been considerably underestimated in 1930, for at that time it was not known that at suitable hours it could be more readily observed and captured out of doors than in houses. Sandflies became rare towards the end of October 1932, while they were still numerous in Malta.

Investigations were made in Greece during 3 weeks in August 1932. In Kavallah, Macedonia, *P. papatasii*, *P. sergenti*, *P. macedonicus* and *P. tobbi*, Adl. Thdr. & Lourie, were common, but only four females of *P. major* were found. Relatively few cases of visceral or cutaneous leishmaniasis have been recorded from Macedonia. In Athens the

sandflies collected were *P. papatasii*, *P. sergenti*, *P. parroti*, *P. minutus* and *P. major*, which was particularly common in a neighbourhood where several cases of infantile kala-azar have recently been observed; *P. perniciosus* was not taken, and *P. major* is probably the vector of visceral leishmaniasis in the City. Infantile kala-azar is rare in Argos, but is common in the neighbouring hills; only one example of *P. papatasii* and one of *P. sergenti* were found in Argos, whereas in a village nearby (altitude about 820 ft.), where 3 cases of the disease had been diagnosed within the previous 12 months, 46 males and 15 females of *P. major* were taken in an hour, together with one female of a variety of *P. chinensis*, Newst.

During the summer and autumn of 1933, *P. macedonicus* was found to be very common in the Valley of Jezreel, appearing in large numbers about midnight. It was the only species of the group of *P. major* found in the Valley. It was taken near a house where a case of infantile kala-azar was contracted and is therefore to be regarded as a carrier, although it is probably not a very efficient one, since the disease is rare in Palestine. Since 1921 only five locally acquired cases of the disease have occurred, two in the Valley of Jezreel and one in a district of Jerusalem where *P. major* var. *syriacus*, Adl. & Thdr., is common. *P. macedonicus* is known from Greece, Malta, Palestine and Hungary.

Further feeding experiments [*cf.* **19** 217] were carried out during 1931–33. *P. perniciosus* and *P. major* were infected with *L. infantum* by feeding on dogs, hamsters, and *Citellus*, and the distribution of the flagellates in them was studied. *P. perniciosus* was also infected by feeding on human cases of infantile leishmaniasis. The experimental infection rate was higher in *P. major* than in *P. perniciosus*. *P. major* var. *syriacus*, *P. tobbi* and a variety of *P. chinensis*, common in Galilee, were also infected with *L. infantum* by feeding on animals. *P. papatasii* and *P. sergenti* could be infected with *L. infantum* by feeding on animals with a very intense infection. *P. perniciosus*, *P. tobbi*, *P. major* var. *syriacus*, *P. chinensis* var. and *P. macedonicus* were infected with *L. donovani* from India by feeding on hamsters. There was a considerable variation in the distribution of flagellates in individual sandflies. Susceptible animals were infected by inoculation of flagellates into the skin. *Citellus* was infected by introducing flagellates deposited from the proboscis of an infected sandfly into the capillary of a Hertig apparatus, which corresponds to transmission by bite. The manner in which the flagellates leave the proboscis of the sandfly is discussed. Experimental evidence implies that only those infected sandflies that have flagellates in the distal part of the proboscis are capable of depositing them in the skin during the act of biting. Most of the infected sandflies dissected showed no flagellates in the proboscis and cannot therefore transmit the disease. There are at least two distinct strains of Mediterranean *L. infantum*, one from Malta and one from Catania, and two of *L. tropica*, from Baghdad and from Palestine, and it is highly probable that there are distinct strains in all recognised species of human *Leishmania*. In the Malta strain of *L. infantum* a large percentage of infections are confined to the stomach during the greater part of the sandfly season, but from the end of September to the middle of November the infection becomes more anterior and a small number of proboscis infections appear. The Catania strain produces a negligible percentage of infections confined to the stomach; throughout the season the anterior part of the cardia is invaded and a few infections of the proboscis appear sporadically, but again the majority of proboscis

infections appear towards the end of the sandfly season. Although cases of infantile leishmaniasis occur throughout the year, at least 50 per cent. are observed between April and the middle of July, that is, 6 to 8 months after the period of maximum prevalence of proboscis infections in sandflies. The reason for the difficulty of experimental transmission by bite is that the numbers of infected sandflies with flagellates in the distal part of the proboscis are so small that very large numbers would have to be re-fed in order to be certain of including an infective one. The large proportion of infected dogs and the constant occurrence of relatively few new cases of infantile kala-azar in spite of the low percentage of infective sandflies is readily explained by the enormous numbers of *P. perniciosus* in endemic areas.

A brief account is given of experiments with *Phlebotomus* spp. and *Leishmania tarentolae* and *Trypanosoma platydactyli* (erroneously spelt *ptyodactyli* in the previous paper [**19** 218]) in *Tarentola mauretanica.*

FERRIÈRE (C.). **Les Hyménoptères parasites des mouches Tsétsé.**—*Mitt. schweiz. ent. Ges.* **16** no. 5 pp. 328–340, 3 figs., 1 p. refs. Bern, 14th January 1935.

This paper gives a list of 19 Hymenopterous parasites of the pupae of *Glossina* spp. in Africa. Those of *Glossina morsitans*, Westw., are: *Mutilla glossinae*, Turner, the Chalcid, *Stomatoceras micans*, Wtstn., the Eupelmid, *Anastatus viridiceps*, Wtstn., and the Eulophid, *Syntomosphyrum glossinae*, Wtstn., in Northern Rhodesia; *Mutilla benefactrix*, Turner, the Bethylid, *Prolaelius glossinae*, Wtstn., the Chalcids, *Stomatoceras micans*, *S. exaratum*, Wtstn., *Dirhinus giffardii*, Silvestri, and *Haltichella edax*, Wtstn., the Eupelmid, *Eupelmella tarsata*, Wtstn., and *Syntomosphyrum glossinae*, in Nyasaland; *Mutilla auxiliaris*, Turner, in Portuguese East Africa; *Stomatoceras schulthessi*, sp. n., and *Perilampus ruficornis*, F., in Nigeria; and *Syntomosphyrum glossinae* in Tanganyika. *Stomatoceras micans* and *S. schulthessi* have been recorded from *G. tachinoides*, Westw., in Nigeria; *Dirhinus giffardii* from *G. brevipalpis*, Newst., in Nyasaland; and the Diapriid, *Trichopria capensis robustior*, Silv., from *G. pallidipes*, Aust., in Natal. *G. palpalis*, R.-D., is parasitised by *D. giffardii* in Nigeria, *Syntomosphyrum glossinae* in Uganda, the Calliceratid, *Conostigmus rodhaini*, Beq., in the Belgian Congo, and the Diapriid, *Abothropria lloydi*, sp. n., in Tanganyika. The Braconid, *Coelalysia glossinophaga*, Turner, and the Chalcids, *Brachymeria amenocles*, Wlk., and *Dirhinus inflexus*, Wtstn., have been recorded from *Glossina* sp. in the Gold Coast. Descriptive notes are given on all these species except the three Mutillids, the Bethylid, the Braconid and the Calliceratid, and on *Stomatoceras diversicornis*, Kirby, from a single female that emerged from an unidentified Dipterous pupa found in a breeding place of *G. morsitans* in Nyasaland.

JAMES (J. F.). **A Simple Fly Trap.**—*Indian med. Gaz.* **70** no. 1 p. 23, 2 figs. Calcutta, January 1935.

A solution of 1 lb. sugar or molasses and 1 lb. sodium arsenite in 10 gals. water is an effective poison bait for flies, especially in dry weather. Cheap and satisfactory containers were made from rectangular tins measuring 14 by 9 by 9 inches. The tin is placed upright and a slit cut across the centre of the top. A second slit is cut across one

side about 3 inches from the bottom. Cuts are then made diagonally across two sides to join the ends of the slits and the shovel-shaped section removed. The tin is hung on a wall or other support by means of a stout wire threaded across inside the top through holes bored in the cut sides about two inches from the back (the one whole side remaining). A piece of material long enough to reach and cover the bottom of the tin is suspended from the wire inside the top. The material is wetted with the bait, which is placed in the bottom of the tin to a depth of one inch. A modified container is made by continuing the slit in the side half way along the two adjacent sides and then cutting upwards at right angles until the cuts meet the ends of the top slit.

BEDFORD (G. A. H.). **Scientific Results of the Vernay-Lang Kalahari Expedition, March to September, 1930. Report on the blood-sucking Diptera.**—*Ann. Transv. Mus.* **16** no. 4 pp. 605–607. Pretoria, 21st February 1935.

This list of blood-sucking Diptera collected in the Kalahari in 1930 includes *Anopheles coustani*, Lav. (*mauritianus*, Grp.), *A. gambiae*, Giles, *A. squamosus*, Theo., and *Glossina morsitans*, Westw.

SHINODA (O.) & ANDO (T.). **Diurnal Rhythm of Flies.** [*In Japanese.*] —*Bot. & Zool.* **3** no. 1 pp. 117–121. Tokyo, January 1935.

Of the flies taken in houses in Kyoto, *Fannia canicularis*, L., *Calliphora lata*, Coq., and *Ophyra nigra*, Wied., were most numerous from May to July. They began to be active at about 20°C. [68°F.] and were most abundant at 26°C. [78·7°F.]. *Musca domestica*, L., *Sarcophaga carnaria*, L., and *Lucilia cuprina*, Wied. (*argyricephala*, Macq.) were most common from August to September. *Musca* and *Sarcophaga* were collected in greatest numbers at about 28°C. [82·4°F.], *Lucilia* at 30°C. [86°F.]. In mid-May the flies were taken mostly at about 11 a.m. but from late May to early September at 9 a.m. and again at 3 p.m.; they were least numerous at about 1 p.m. With the exception of *Lucilia*, they were more numerous before than after noon.

ENDERLEIN (G.). **Dipterologica. i–ii.**—*S.B. Ges. naturf. Fr. Berl.* **1933** no. 8–10 pp. 416–429, 1 ref.; **1934** no. 4–7 pp. 181–190, 1 ref. Berlin, 1934.

New genera described in the first paper include *Stomachobia* erected for *Gastrophilus pecorum*, F., and allied species, and *Enteromyia* for *G. haemorrhoidalis*, L., and *G. flavipes*, Ol.

The second paper includes descriptions of two new genera and species of Tabanids from Madagascar and a new species from Siberia.

CHRISTIANSEN (M.). *Argas reflexus* **Latreille (Duemiden) i Danmark.** —*Maanedsskr. Dyrlaeg.* **46** pp. 6–15, 3 figs., 4 refs., 1934. (Abstr. in *Vet. Bull.* **5** no. 3 p. 139. Weybridge, March 1935.)

In April 1930, *Argas reflexus*, F., was found, for the first time in Denmark, in a pigeon loft in Copenhagen.

Trimble (H. E.) & Sherrard (G. C.). **Rat and Rat-flea Survey of Los Angeles Harbor.**—*Publ. Hlth Rep.* **50** no. 3 pp. 74–79, 1 fig. Washington, D.C., 18th January 1935.

A rat-flea survey of the harbour district of Los Angeles, California, was carried out over a period of 19 months from 1st December 1931. The predominant species of rat was *Mus* (*Rattus*) *norvegicus*, and the average number of fleas per rat 2·85. *Leptopsylla segnis*, Schönh. (*musculi*, Dug.) was the most abundant flea. The average number of *Xenopsylla cheopis*, Roths., was slightly less than one per rat, an index that is considered by the authors to be too low to sustain an epidemic of rat plague and probably too low to sustain even an occasional plague infection of rodents. The heaviest infestation by this species was found on rats caught along the water front and at the city rubbish dumps, where the *Leptopsylla* index was lowest, and it is thought that the greater surface moisture in these situations is more favourable to it. Only one example of *Ceratophyllus acutus*, Baker, was taken, although it was the most abundant species on California ground squirrels (*Citellus beecheyi*) in the neighbouring hills. *Polyplax spinulosa*, Burm., and *Echinolaelaps* (*Laelaps*) *echidninus*, Berl., were fairly prevalent on rats at all seasons and in all districts.

Ioff (I.) & Pokrowskaja [Pokrovskaya] (M.). **Ueber das Schicksal der Bacillen des "Zieseltyphus" im Organismus der Flöhe.** [The Fate of Bacilli of "Ground Squirrel Typhus" in Fleas.]—*Z. Hyg. InfektKr.* **116** no. 3 pp. 248–252, 7 refs. Berlin, 1934.

The fleas used in these experiments on the bacillus of the "typhus" of ground squirrels, *Citellus pygmaeus*, were *Neopsylla setosa*, Wagn., *Ceratophyllus tesquorum*, Wagn., *Frontopsylla semura*, Wagn. & Ioff, *Ceratophyllus* (*Oropsylla*) *ilovaiskii*, Wagn. & Ioff, and *Ctenophthalmus orientalis*, Wagn., all from the neighbourhood of Rostov, and an undescribed species of *Ctenophthalmus* collected from nests of field mice brought from Armenia. The same results were obtained with all these species. From 200 to 300 starving fleas were placed on an infected ground squirrel or white mouse and after the death of the host those that had fed were used for the tests. About 66 per cent. of the fleas were found to have acquired infection and the bacilli increased rapidly in their stomachs during the first hours. As a rule the infection disappeared after 4 days, only a few fleas remaining infected after 5 days and only 1 after 12. The intestine therefore cleans itself of this infection without any further ingestion of blood, whereas according to observations in Russia [*R.A.E.*, B **16** 221] bacilli of plague apparently remain active in the flea until its death. No bacilli were found in the excreta of the fleas, but only a few observations were made and the excreta may perhaps be infected during the first day or two. Infected fleas did not transmit the disease to mice, but further work, especially with highly susceptible animals, is required.

Cram (E. B.). **New Avian and Insect Hosts for** *Gongylonema ingluvicola* **(Nematoda : Spiruridae).**—*Proc. helminth. Soc. Wash.* **2** no. 1 p. 59. Washington, D.C., January 1935.

Embryonated eggs of the Nematode, *Gongylonema ingluvicola*, from the oesophagus of a captive mountain quail (*Oreortyx picta*), which died

soon after it had been sent from Oregon to Maryland, were fed to two laboratory-reared cockroaches, *Blattella germanica*, L. When killed 34 days later, these contained larvae of the Nematode tightly coiled in cysts in the body cavity.

McIntosh (A.). **Tropical Rat Mite attacking Man in St. Louis Area.**—*Proc. helminth. Soc. Wash.* **2** no. 1 pp. 62–63. Washington, D.C., January 1935.

Liponyssus bacoti, Hirst, which has been shown experimentally to transmit endemic typhus [*cf. R.A.E.*, B **20** 182, etc.], is recorded from Illinois as causing a dermatitis in employees in stock yards.

Ono (S.). **Studies on the Life-History of Spiruridae in Manchuria. I. The Morphologic Studies on the encysted Larvae found in 2 Species of Dung-beetle, Dragon-fly, Hedgehog, Domestic Fowl and Duck, as well as their Infestation Experiments with Rabbits and Dogs.** [*In Japanese.*]—*J. Jap. Soc. vet. Sci.* **12** pp. 165–184, 4 pls., 3 refs. Tokyo, 1933. (With a Summary in English.)

The insects that have been found to serve as intermediate hosts of *Spirocerca* in Manchuria are the dung beetles, *Gymnopleurus mopsus*, Pall., and *Scarabaeus sacer* var. *peregrinus*, Kolbe, and the dragonfly, *Anax parthenope*, Selys.

Chagas (E.). **Infection expérimentale par le** *Schizotrypanum cruzi* **chez l'homme.**—*C. R. Soc. Biol.* **118** no. 7 p. 718. Paris, 1935.

Three larvae of *Panstrongylus* (*Triatoma*) *megistus*, Burm., infected with *Trypanosoma* (*Schizotrypanum*) *cruzi* were allowed to bite a man, who was bitten 23 days later by an infected adult of the same species. The incubation period of Chagas' disease in experimental infection in man is ordinarily 10–12 days, but in this case no symptoms were observed during 30 days from the first bites and inoculation of blood into a guineapig gave negative results. The deposition of excreta on the skin was carefully avoided.

Satyanarayana (K.). **Anti-malarial Operations in the Vizagapatam Harbour Construction Area (1927–1933).**—*Rec. Malar. Surv. India* **4** no. 4 pp. 343–362, 2 maps, 5 graphs, 9 refs. Calcutta, December 1934.

The author deals briefly with the history of malaria control measures carried out in the Vizagapatam Harbour area, describes the work that has been done during the four years since he took charge in 1930, and makes suggestions regarding the more important permanent measures that should be undertaken in the future. As a result of the measures, which consist chiefly of Anopheline control by drainage and the application of oil and Paris green, no outbreaks of malaria occurred during the period of construction of the harbour, and its incidence among the harbour employees has decreased. In an appendix the organisation of the work is described, and notes are given on the larvicides used. Crude oil mixed with 1 per cent. cresol (non-saponified) in less saline waters and with 2 per cent. in highly saline waters was effective against mosquito larvae. A 5 per cent. mixture of Paris green (by weight), with soapstone as a diluent, killed all mature Anopheline larvae. Paris green applied against *Anopheles culicifacies*,

Giles, in rice-fields had no harmful effects on the rice. Petrol at the rate of 4 oz. per square yard of surface was a satisfactory larvicide for wells. Balls made by stitching up a mixed mass of waste cotton, maize cobs and sawdust in bags of coarse sacking were soaked for 24 hours in oil and then fixed in streams, where they provided a continuous supply of oil, which formed a good film on streams and drains for about a week. A total of 19 species of Anophelines were found in the Vizagapatam area, of which A. *culicifacies* and *A. stephensi*, List., which bred chiefly in wells and streams, were the most prevalent malaria vectors.

MEASHAM (J. E.) & CHOWDHURY (M. U.). **A Note on the Anopheline Mosquitoes of the Anaimallai Hills.**—*Rec. Malar. Surv. India* **4** no. 4 pp. 363–365. Calcutta, December 1934.

Dissections of 1,200 Anophelines comprising 16 species collected on tea estates situated at an average altitude of 3,000–4,000 ft. in the southern part of the Coimbatore district, revealed malaria parasites in *Anopheles fluviatilis*, James, only. Larvae of this species breed during the dry season along the grassy edges of slow-moving streams, except where there is dense shade. From June to October, when the rivers are in flood, no larvae could be found in them, although a few were taken in wells and shallow collections of water in association with *A. varuna*, Iyen. From November to February, the night temperatures fall below 60°F. The malaria transmission season is from March until the beginning of the south-west monsoon, which usually starts early in June. Night temperatures at this time are in the neighbourhood of 70°F., and conditions for mosquito breeding are ideal. Dissections of *A. fluviatilis* carried out from January to June 1934 showed malaria parasites in 12·2 per cent. in April, 8·22 per cent. in May, and 7·14 per cent. in June ; no gland infections were found in June.

IYENGAR (M. O. T.). **Anophelines infected with Malaria Parasites : a further Note.**—*Rec. Malar. Surv. India* **4** no. 4 pp. 371–372, 1 ref. Calcutta, December 1934.

Further examination has shown that among the Anophelines reported in a previous paper [*R.A.E.*, B **22** 142] to have been found infected with malaria parasites in Travancore, those recorded as the typical form of *Anopheles jeyporiensis*, James, were in reality var. *candidiensis*, Koidz., although the typical form also occurs in Travancore. Further dissections of the species previously found infected revealed no gland infections, but 1 gut infection among 1,845 *A. jeyporiensis* var. *candidiensis*, and 2 gut infections among 228 *A. fluviatilis*, James. Negative results were obtained with 708 *A. culicifacies*, Giles, and 62 *A. varuna*, Iyen.

MEHTA (Dev Raj). **Effect of " Saline and Free " Ammonia on the Oviposition of *Anopheles culicifacies* and *Anopheles subpictus* (*rossi*).**—*Rec. Malar. Surv. India* **4** no. 4 pp. 411–420, 1 graph, 20 refs. Calcutta, December 1934.

The experiments described were undertaken at Karnal, Punjab, to determine whether ovipositing females of *Anopheles culicifacies*, Giles, and *A. subpictus*, Grassi, discriminate between waters with varying contents of saline and free ammonia.

The following is taken from the author's conclusions and summary: *A. culicifacies* oviposited indiscriminately in the laboratory in waters with an ammonia content within a certain range. Females refused to oviposit in water with an ammonia content of more than 6 parts per million when there was other water present. In nature the larvae have not been found in water with ammonia exceeding 1 p.p.m. [*cf. R.A.E.*, B **16** 247], so that either the females do not lay eggs on waters with a high ammonia content, or the young larvae do not live long under such unfavourable conditions. *A. subpictus* will oviposit in water containing 8 parts per thousand ammonia even when water with less ammonia is available, but no eggs were laid in water with a higher concentration. Laboratory experiments indicate that the females of this species have a marked tendency to lay eggs on foul water.

Gaschen (H.). **Recherches entomologiques dans la province du Yunnan.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 9 pp. 873–892, 1 fldg pl., 14 refs. Hanoi, 1934.

In view of the increased communication between Tonkin and Yunnan, an Anopheline survey was carried out by Dr. Morin in January 1934 and another by the author in August and September of the same year, to determine the species that occur at various localities in Yunnan on the Hanoi-Yunnanfu railway. A previous malaria survey had indicated that malaria was hyperendemic for the first 82 miles from Lao-kay towards Yunnanfu, that is up to altitudes of about 1,300–2,000 ft.; from there to Yunnanfu the malaria incidence was not serious.

The following is largely taken from the author's summary and conclusions: The species found were *Anopheles hyrcanus* var. *sinensis* Wied., which constituted 91 per cent. of the larvae and 80·7 per cent. of the adults taken, *A. vagus*, Dön., *A. minimus*, Theo., *A. jeyporiensis*, James, *A. lindesayi*, Giles, *A. maculatus*, Theo., *A. aitkeni*, James, *A. barbirostris*, Wulp, *A. kochi*, Dön., *A. gigas*, Giles, and *A. culicifacies*, Giles. Oöcysts were found in one example of *A. culicifacies*. It is suggested that the endemic malaria of the plateaux of Yunnan may be more easily explained by the presence of this species, than by that of *A. hyrcanus* var. *sinensis* or *A. vagus*, neither of which were found infected despite numerous dissections. The maxillary indices of *A. hyrcanus* var. *sinensis* and *A. vagus* varied from 14 to 16, whereas in *A. culicifacies* and *A. minimus* they were between 11 and 12. Larvae of *A. hyrcanus* var. *sinensis* were taken at an altitude of 7,880 ft. In one locality, 27 males and 3 females of *Phlebotomus barraudi*, Sinton, were caught in buildings adjacent to vegetable gardens [*cf. R.A.E.*, B **22** 190].

de Buen (E.). **Estudios sobre la biologia del** *Anopheles maculipennis* **Meig. Indice maxilar y longitudes de la ala, abdomen y tórax.** [Studies on the Biology of *A. maculipennis*. The maxillary Index and the Lengths of the Wing, Abdomen and Thorax.]—*Med. Países calidos* **8** no. 2 pp. 73–84, 9 graphs., 9 refs. Madrid, February 1935.

The following is taken from the author's summary of the results of measurements of over 2,000 examples of *Anopheles maculipennis*, Mg., made during 1933 and 1934 in the province of Cáceres, Spain.

The maxillary index was 15·9 and the average wing-length 4·55 mm. There was little variation in the maxillary indices in the two districts investigated, and the wing-length was the same in animal quarters of both and shorter in the dwellings in one of them. If races occurred, it was not possible to distinguish them by maxillary index or wing-length. As a rule the length of the abdomen was less than that of the wing. The maxillary index did not vary with the size of the mosquito, and since it remained constant, it appeared to be a good character for studying races. Mosquitos appeared to be smaller where the temperature was higher.

LePrince (J. A.). **Investigations on the Malarial Mosquito at the Reelfoot Lake Biological Station.**—*J. Tenn. Acad. Sci.* **10** no. 1 p. 25. Nashville, Tenn., January 1935.

In the course of observations on Anophelines in Tennessee in 1933 and 1934, *Anopheles crucians*, Wied., was sometimes taken in light-traps at night though it was not seen flying near by. In tests of the effect of colour on selection of daytime resting places in houses by *A. quadrimaculatus*, Say, 3,434 out of 11,409 individuals settled on various coloured surfaces, and 7,975 on white ones. In similar investigations, *A. crucians* in New Orleans and *A. maculipennis*, Mg. (*occidentalis*, D. & K.) at Salt Lake City showed no colour preference. Exposure to full sunlight at noon on hot days killed *A. quadrimaculatus*. Attics of houses often became too hot for the Anophelines to live.

Williamson (K. B.). **The Control of Rural Malaria.**—*M.A.H.A. Mag.* **3** nos. 3–4 pp. 145–150, 201–206; **4** nos. 1–2 pp. 224–228, 281–291. Kuala Lumpur, July & October 1933; January & April 1934. [Recd. March 1935.]

The usual measures employed against Anopheline larvae in the control of malaria, such as drainage and the application of oil and Paris green, are reviewed, and the impossibility of applying them to large rural areas in Malaya is pointed out. The possible value of such agents as gas and vapour poisons [*R.A.E.*, B **12** 119] and slowly dissolving mineral poisons [*cf.* **21** 254] is discussed. Measures most likely to be of value in rural areas are those that can be carried out by the inhabitants without skilled supervision and with material found on the spot. These include particularly such methods as "herbage cover" in which green vegetation is piled in shallow water [*cf.* **21** 254], sluicing [*cf.* **21** 66] and the use of larvivorous fish, insects, and plants [*cf.* **15** 106]. There is growing evidence that the chemical constitution of the soil is important in determining the distribution of the species of Anophelines that transmit malaria. The freedom from the disease of the coastal rice belt in Malaya is related to a high content of organic matter, including organic nitrogen, in its soils, coupled with imperfect drainage, which, by leaving the land water-logged even in the fallow season, causes decay of dead vegetable as well as animal matter to take place in the soil in the absence of air. Thus any policy for the control of rural malaria should aim at enriching the soil by encouraging intensive agriculture and at the same time increasing the number of cattle and pigs, which both contaminate and fertilise the soil and at the same time may attract mosquitos away from man. The use of rotting vegetation [*cf.* **16** 69], of plants that cover the water surface,

of shade plants, and of water polluted with factory refuse or with soap from bathing pools, laundries, etc., is also mentioned. The advantages of employing the most suitable methods of control in each particular situation and of combining several methods, where possible, are emphasised. In certain stagnant ditches, pools, water-logged marshes, etc., natural biochemical control is effective in preventing Anopheline breeding, and it is of importance that these areas should be recognised so that wasteful treatment is avoided. Mosquito larvae are prevented from feeding, and they, as well as pupae, cannot breathe in water that is agitated ; moreover, oviposition occurs on water that is still. For these reasons, control might be effected in small collections of water by artificial agitators operated by the water outfall. Experiments by other workers on cheap methods of subsoil drainage are briefly reviewed [*cf.* **22** 149, 177 ; **23** 92], and a plan for organising villagers to carry out malaria control in rural areas by means of the measures discussed is outlined.

UCHIDA (T.) & MIYAZAKI (I.). **Life-history of a Water-mite parasitic on** *Anopheles.—Proc. imp. Acad. Japan* **11** no. 2 pp. 73–76, 1 fig., 1 ref. Tokyo, February 1935.

The habits of the Hydrachnid, *Arrenurus* (*Arrhenurus*) *madaraszi*, Daday, descriptions of which are given, were noted by the junior author in rice-fields and pools at Yatsushiro, Japan in 1933–34. The eggs were laid on the lower surface of leaves of aquatic plants. The larvae, which hatched in 4–5 days, attached themselves to pupae of *Anopheles* and *Culex*. When the mosquitos emerged, the larvae attached themselves to the lower surface of the abdomen of *Anopheles* and to the neck and thorax of *Culex*. Mosquitos parasitised by more than 4 individuals were inactive and did not attack man. In 1–2 days the mite separated from the host and remained motionless on the bottom for 2–3 days before becoming a nymph. The nymphal stage lasted about 12 days ; the nymphs and adults preyed on small crustacea.

SMART (J.). **On the Biology of the Black Fly,** *Simulium ornatum*, **Mg. (Diptera, Simuliidae.)**—*Proc. R. phys. Soc. Edinb.* **22** pt. 4 pp. 217–238, 4 figs., 10 refs. Edinburgh, July 1934.

This is an account of laboratory investigations in Edinburgh on *Simulium ornatum*, Mg., during 1930–32. An apparatus in which it was bred from egg to adult is described. The larvae are found from May to September in streams on leaves of *Glyceria fluitans* and in winter on stones in the stream-bed. The overwintered larvae are fully grown by March [*cf. R.A.E.*, B **21** 93]. Pupation takes place in the second half of April on the stones. The adults emerge in April–May and lay their eggs on both surfaces of the leaves of *G. fluitans*. Egg-masses invariably occur in relatively fast waters. The larvae from these eggs pupate at the beginning of July. Eggs are found from the last week of July to the middle of October. It is uncertain whether the late eggs belong to females of the summer generation of which the larval development had been retarded or to females that are the offspring of this generation. In 1932 there were indications of a distinct autumn generation, and in October 1933 a flight of adults was observed. Eggs collected immediately after oviposition and kept at about 16°C.

[60·8°F.] in water aerated by a jet of compressed air, or on moist blotting paper in a very humid atmosphere, took 5–6 days to hatch. Larval development required 7–14 weeks in summer and 6–7 months in winter, and the pupal stage lasted 4–12 days. A Mermithid and protozoa of the genera *Thelohania* and *Serumsporidium* attacked the larvae. Flies, whether they had been bred in captivity or caught in the field, could not be induced to feed either on man or rabbits, and were not observed to feed on moistened sugar or raisins. Cattle and sheep near the stream did not appear to be troubled by Simuliids. Certain features of the larval anatomy and the spinning of the cocoon are described, and the feeding habits of the larvae and the oxygen content of the water [*cf. R.A.E.*, **19** 149] discussed.

SELWYN-CLARKE (P. S.). **Trypanosomiasis in the Gold Coast (with Special Reference to 1933–34).**—*Rep. med. Dep. Gold Cst 1933–34* pp. 100–107, 1 map. Accra, 1934. [Recd. March 1935.]

The incidence of sleeping sickness is low in the coastal areas of the Gold Coast (7·1 per 10,000 patients treated in 1933–34), increases in the forest belt (84·6) and is still higher in the savannah belt (87·3). There is evidence suggesting that a certain proportion of the cases in both the coastal and forest areas are immigrants from endemic and epidemic areas in the Northern Territories or from neighbouring French Territory. Investigations carried out during the past few years indicate that the most heavily infected area in the Gold Coast is in the northern section of British mandated Togoland, where the infection rate is about 11 per cent., and that the present outbreak there began in 1929–30. Investigations have been carried out in the Mamprusi region, which includes part of the northern Territories and the northern section of Togoland. In northern Mamprusi, where the waterways are mainly large rivers and most of the people live in large villages, conditions are less favourable to infection than in southern Mamprusi and particularly the mandated section of it, where there are many small waterways that are almost dry during the dry season, and the population is scattered in numberless small farms. *Glossinapalp alis*, R.-D., is the principal vector of *Trypanosoma gambiense*, but *G. tachinoides*, Westw., which is able to breed under tall trees in southern Mamprusi, may also be concerned in transmission. *G. palpalis* is found near fords and river crossings, at pools and water-holes in dried waterways and along the banks of rivers. It appears to increase in density towards the end of the rains in September. The campaign against fly in the Mamprusi region was confined to making clearings 50 yards wide round water holes and villages and for 100 yards on either side of the crossings of main roads over streams. Over 90 per cent. of the villages mentioned in the census report of 1931 were located and cleared before the beginning of the rainy season of 1934–35.

LESTER (H. M. O.). **Report of the Tsetse Investigation.**—*Rep. med. Hlth Serv. Nigeria 1933* pp. 74–83. Lagos, 1934. [Recd. March 1935.]

An investigation of some 17 Nigerian strains of polymorphic trypanosomes has shown that there are not only strains having all the characteristics of *Trypanosoma rhodesiense* but others showing characteristics intermediate between this trypanosome and *T.*

gambiense. Thus it is concluded that *T. rhodesiense* is only a virulent type of *T. gambiense* that usually arises as a result of idiosyncrasies in the resistance of the human host.

In south-eastern and southern districts of Kano, the existence of *Glossina tachinoides*, Westw., was frequently found to depend on a belt of light vegetation, which was in many cases only 10 yards in width, and the judicious clearing of narrow belts of riverine vegetation was recommended in order to reduce the contact between man and fly to a mimimum.

During September, at the end of the rains, 33 per cent. of the females of *G. morsitans*, Westw., and 11 per cent. of those of *G. tachinoides* were found to be attacked by a fungus.

Corson (J. F.). **A High Rate of Salivary Gland Infection of** *Glossina morsitans* **with** *Trypanosoma rhodesiense*.—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 5 pp. 501–504, 2 refs. London, 8th March 1935.

By the feeding of two infected examples of *Glossina morsitans*, Westw., a reedbuck was infected at the Tinde Laboratory, Tanganyika Territory, with a strain of *Trypanosoma rhodesiense* isolated from man and maintained by cyclical transmission through *G. morsitans* and dikdiks [*cf. R.A.E.*, B **23** 65]. About 150 flies were allowed to bite the infected reedbuck on one or two occasions. They were subsequently maintained for 15 days by feeding daily on a healthy sheep and were then allowed to bite three monkeys (*Cercopithecus*), all of which became infected. The 85 surviving flies were isolated and each allowed to bite a rat ; 47 rats became infected. This result and dissection of most of the flies showed that 60 per cent. had trypanosomes in the salivary glands, 4 flies that had failed to infect rats having a slight, probably early infection, which may have developed after they had bitten the rats. The temperature in the laboratory ranged from 70 to 85°F. or sometimes 90°. The flies were kept in boxes over water in trays, partly to keep the air moist and partly to guard against the attacks of ants. In a similar experiment, flies from the same batch of pupae were fed on a dikdik infected with the same strain of trypanosome but, although the infection was transmitted to a monkey and 32 flies survived to feed singly on rats, no infected fly was isolated. In view of the unexpectedly high rate of infection of the salivary glands, an attempt was made to repeat the experiment with the reedbuck. Laboratory-bred flies were allowed to feed twice on the same reedbuck and were afterwards fed daily for 10 days on a healthy sheep. They were then fed daily on a monkey, which became infected. On the 27th day after the first feed on the reedbuck the 84 remaining flies were dissected and 33·3 per cent. showed infection of the salivary glands. In a control experiment laboratory-bred flies were allowed to feed on 3 consecutive days on a monkey infected by the bites of flies that had fed on the reedbuck ; they were subsequently fed daily for 8 days on the same healthy sheep as in the previous experiment and then on healthy guineapigs. The flies were dissected on the 27th day after the first infecting feed and only 1·1 per cent. showed infection in the salivary glands. The high rate of infection of the salivary glands would appear to be connected with the special suitability of the reedbuck's blood for the development of the trypanosomes in the fly.

BRYANT (J.). **Endemic Retino-choroiditis in the Anglo-Egyptian Sudan and its possible Relationship to** *Onchocerca volvulus*.—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 5 pp. 523–532, 2 pls., 1 map, 7 refs. London, 8th March 1935.

The author describes an endemic disease causing blindness in the Bahr-el-Ghazal Province of the Anglo-Egyptian Sudan, which has become epidemic within the last 5–10 years. Its distribution is local, being largely along the banks of rocky streams, and appears to be identical with that of *Onchocerca volvulus*. The differences between it and onchocercal keratitis are discussed. It was found where manifestations of *O. volvulus* were noted, and was most common where these were most numerous. For these reasons, it is believed to be due to *O. volvulus*, which is recorded for the first time from the Sudan, together with its various manifestations, including punctate keratitis, hydrocele and elephantiasis. The last two conditions are believed to be due to this parasite rather than to *Filaria bancrofti*, which has not been demonstrated in them. The common species of *Simulium* is *S. damnosum*, Theo., which appears in swarms in the evening but disappears at sunset. The flies are most numerous when the rivers are in flood. They were found in large numbers indoors more than half a mile from water, although none was noted on the road outside or in native huts about half a mile further on.

DUKE (H. L.). **On** *Trypanosoma brucei*, *T. rhodesiense* **and** *T. gambiense* **and their Ability to infect Man.**—*Parasitology* **27** no. 1 pp. 46–67, 30 refs. Cambridge, 11th March 1935.

The following is largely taken from the author's summary of experiments in all of which *Glossina palpalis*, R.-D., was the tsetse fly used.

A strain of *Trypanosoma rhodesiense*, isolated from man in Tanganyika Territory and readily transmissible by tsetse, was passed by direct inoculation through a series of 14 guineapigs over a period of 18 months. At the end of that time it had almost lost its transmissibility and it also failed to infect man. Another line of the same strain after 98 days in a bushbuck, 30 days in a fowl and 294 days in 3 oxen, proved still readily transmissible and also readily infective to man. A second strain underwent 7 consecutive cyclical passages, then 2 passages by syringe and finally another cyclical passage, all through monkeys, except one through a reedbuck. When tested cyclically at the eleventh and twelfth passages, it was found to be non-infective to man though infective to monkeys. A strain of *T. gambiense* isolated in November 1920 from a patient from Fernando Po was found in February 1934 to be readily infective to man, although it had been maintained in laboratory animals and had undergone syringe passage through a series of 14 guineapigs. It was entirely non-transmissible by and almost non-infective to *G. palpalis*. Three strains of *T. brucei* from different parts of Uganda did not infect normal healthy men bitten by cyclically infected flies. A freshly isolated strain of *T. gambiense* from a Uganda native was transmitted cyclically to man. A strain of *T. rhodesiense*, shortly after its recovery from a native of Tanganyika Territory, underwent 3 successive cyclical passages from monkey to monkey ; at each passage the strain was tested on man and found to be infective. A strain from Nigeria showing points of resemblance to both *T. gambiense* and *T. rhodesiense* was found to be

pathogenic to man, on subcutaneous inoculation of infective blood, three years and 10 months after its first isolation.

The loss of pathogenicity to man in strains of *T. rhodesiense* demonstrates the comparative instability of this character and shows how easily this trypanosome may revert to a form indistinguishable from *T. brucei*, the seemingly harmless parasite of big game. The retention of the power to infect man in a strain of *T. gambiense* kept for long periods in laboratory animals, including guineapigs, appears to confirm the relative antiquity of this trypanosome as a parasite of man.

DUKE (H. L.). **Further Studies of the Behaviour of** *T. rhodesiense*, **recently isolated from Man, in Antelope and other African Game Animals.**—*Parasitology* **27** no. 1 pp. 68–92, 20 refs. Cambridge, 11th March 1935.

The experiments described are part of the investigations [*cf. R.A.E.*, B **21** 203] on the effect of prolonged residence in antelope on the transmissibility by *Glossina palpalis*, R.-D., and on the pathogenicity to man of *Trypanosoma rhodesiense* and *T. gambiense*.

The following is largely taken from the author's summary: *T. rhodesiense* retained its cyclical transmissibility after at least 600 days in an antelope, but prolonged residence in these animals tended to impair the power of a strain to infect man by cyclical transmission. Thus of six volunteers exposed to tsetse infected from antelopes with *T. rhodesiense* that had been maintained in these animals for many months, only one become infected. As the cyclical method of transmission is the one operating in nature, these observations suggest that, although certain species of antelope are favourable hosts for *T. rhodesiense*, yet, as a reservoir from which tsetse can become infected with trypanosomes pathogenic to man, these animals do not constitute so great a menace as has been supposed. On the other hand, flies cyclically infected from monkeys inoculated by syringe with trypanosomes from the antelopes transmitted the infection to every volunteer exposed. In the one experiment in which the monkey was cyclically infected from the antelope, the flies that fed on it transmitted the trypanosome to one volunteer but not to the other. There is thus a suggestion that the passage through the monkey prepared the trypanosome for survival in man. One strain of *T. rhodesiense*, however, lost its power to infect man despite repeated passages through monkeys.

T. rhodesiense is admittedly indistinguishable from *T. brucei*, except that it is pathogenic to man. It has been shown that it can lose this attribute, and the present observations indicate that men differ in their resistance to trypanosomes and that the strains differ in their pathogenicity to a given individual. It is possible that strains strongly pathogenic to man will infect anyone, but that when the pathogenicity of a strain has been weakened it will only infect abnormally susceptible individuals. Observations also indicate that there may be a difference in the suitability of the various species of antelopes as hosts. A young hyaena infected with *T. rhodesiense* for 180 days remained in excellent health; flies infected from a monkey sub-inoculated from the hyaena after 80 days infected a volunteer. Flies fed twice on monkeys, infected with a strain of *T. rhodesiense* non-pathogenic to man and nourished on human blood during the first 3 weeks of the cycle of development of the trypanosomes, were still unable to infect man on completion of the cycle, although 6 gland-infected flies fed on the volunteers. A strain

of *T. rhodesiense*, after a series of cyclical passages through a reedbuck and 6 monkeys, was found to be non-pathogenic to man, although it was tested on 9 different volunteers. It is possible that this strain owed its original association with man to meeting an abnormally susceptible individual ; there is nothing to distinguish it from *T. brucei* except its isolation from man. A single cyclically infected fly infected a volunteer after feeding once. A monkey inoculated with the blood of an oribi, cyclically infected about 5 months previously with *T. gambiense*, failed to show any signs of infection. An attempt to infect a situtunga cyclically with a strain of *T. gambiense* from a monkey inoculated from a native was unsuccessful, although two sheep exposed to the same flies became infected.

MELLANBY (K.). **A Comparison of the Physiology of the two Species of Bed-bug which attack Man.**—*Parasitology* **27** no. 1 pp. 111-122, 3 figs., 7 refs. Cambridge, 11th March 1935.

The investigation described was carried out to determine whether there are physiological differences in *Cimex lectularius*, L., the principal species of bed-bug in temperate countries, and *C. hemiptera*, F. (*rotundatus*, Sign.), the principal species in the tropics, that would account for their different geographical distributions, since their morphology, anatomy and habits are very similar.

The following is taken from the author's summary : Physiologically the two species resemble one another in many respects. Their water balance is similar, they are very little affected by humidity if there is plenty of food available, and their thermal death points are identical. At temperatures below 30°C. [86°F.] *C. lectularius* is able to breed more rapidly and more successfully than *C. hemiptera*. Between 30 and 35°C. [86 and 95°F.] the behaviour of both species is similar, and above 35°C. *C. hemiptera* may be the more efficient species. Under moist conditions, *C. lectularius* is the more resistant to starvation and desiccation. The results indicate that although it is more fitted to inhabit temperate countries, if introduced into the tropics it should be able to carry on at least as well as *C. hemiptera*. Studies of the geographical distribution indicate that the latter has spread throughout the tropics but has never become established elsewhere. The former has spread all over the temperate zones and into ports in some tropical countries.

MACLEOD (J.). *Ixodes ricinus* **in Relation to its Physical Environment. II. The Factors governing Survival and Activity.**—*Parasitology* **27** no. 1 pp. 123–144, 8 figs., 17 refs. Cambridge, 11th March 1935.

The laboratory investigations on the effects and inter-effects of different physical factors in its environmental complex on the tick, *Ixodes ricinus*, L., [*R.A.E.*, B **22** 161] have been continued, and this paper gives the results obtained with active unfed ticks. In these ticks, consideration must be given not only to the conditions under which development proceeds most favourably with least mortality, but also to conditions favourable to reaching a host.

In experiments with larvae and nymphs at different combinations of temperature and humidity, the most striking feature was the narrow range of humidity within which survival is possible. Even at 10°C.

[50°F.], all examples of both stages died in 15 days at humidities below 70–75 per cent. Nymphs appear to be slightly more resistant to dry conditions than larvae. At the upper temperature limit of 35°C. [95°F.] both stages died in saturated air but survived at a humidity of 95 per cent.

Larvae, nymphs and adult females show considerable powers of resistance to freezing, if the temperature be lowered slowly so as to allow of the development of a cold hardiness ; the upper temperature limit for survival, on the other hand, is not very high (about 40°C. [104°F.] for larvae and nymphs).

Within these survival limits of temperature and humidity, the conditions necessary to allow of the ticks gaining access to hosts are those that permit of normal activity. The nymphs and adults become active at temperatures of 11°C. [51·8°F.] and over. If the preferred temperatures are taken as the most favourable for normal activities, the limits of 14–23°C. [57·2–73·4°F.] are indicated for larvae and nymphs. In nature, the unfed tick is found on the tops of vegetation, whence it is rubbed off by passing hosts. The larvae and nymphs were found to be negatively geotropic in daylight within temperature limits of 14–24°C [57·2–75·2°P.], and within these limits they will tend to climb to the tops of grasses, rushes, etc. Thus the limiting factor for host parasitisation as opposed to survival would appear to be temperature. The various experiments with unfed ticks have been carried out at all seasons of the year, as have also the processes of feeding and development, but in no case has any indication been obtained of a seasonal diapause.

Gabaldon (A.). **Nota sobre hábitos diurnos, temperatura de yacimientos larvarios y yacimientos larvarios artificiales de** *Anopheles* **de Venezuela.** [A Note on the Diurnal Habits, on the Temperature of larval Breeding Places and on artificial Breeding Places of Venezuelan *Anopheles*.]—*Gac. méd. Caracas* **40** no. 5 pp. 72–75. Caracas, 15th March 1933.

In Venezuela, *Anopheles albitarsis*, Arrib., a known vector of malaria, has been observed biting in a sun-lit corridor of a house, between 7 a.m. and 4 p.m. on a motor launch making a river trip, and between 9 and 10 at night in places brightly lit by electricity. It has also been noticed to leave a comparatively dark and sheltered resting place in order to bite between 11 a.m. and 3 p.m. despite exposure to light and a strong breeze. It readily bites the palm of the hand or the tips of the fingers. *A. bachmanni*, Petrocchi, has not been observed to bite during the day.

Natural pools where a species of *Eichornia* was growing nearly always contained larvae of *A. albitarsis* and *A. bachmanni*, but no Anopheline larvae were found in waters with vertical grasses, though there were often many Culicine larvae. When Lemnaceae developed on the surface of water in artificial excavations, Culicine larvae bred there and when *Eichornia* followed, the pits became breeding places for the Anophelines. Larvae of *A. albitarsis* and *A. bachmanni* in all stages of development were found in water at temperatures of 30–34°C. [86–93·2°F.]. Larvae of both species in the third and fourth instars, taken from water at 34°C. and nourished artificially developed to adults. Various Culicine larvae from water at 37°C. [98·6°F.] also produced adults.

In Venezuela garden plants are often surrounded by an annular trough of water (ant-ring) in order to safeguard them from injurious insects. Such waters may contain aquatic plants and Culicine larvae, and near Trujillo larvae of *A. argyritarsis*, R.-D., were seen in them.

Werneck (F. L.). **Notas para o estudo da ordem Anoplura.** [Notes for the Study of the Order Anoplura.]—*Mem. Inst. Osw. Cruz* **29** fasc. 1 pp. 179–187, 11 figs. Rio de Janeiro, 1934. [Recd. March 1935.]

Microthoracius cameli, L., is re-described from specimens from camels (*Camelus dromedarius*) in Algeria, and *Eulinognathus caviae*, sp. n., is described from *Galea leucoblephara* in Argentina.

Monteiro (J. Lemos). **Vaccina contra o " typho exanthematico " de S. Paulo. Novas correlações entre esta infecção e a febre maculosa das Montanhas Rochosas.** [A Vaccine against S. Paulo Exanthematic Typhus. New Links between this Infection and Rocky Mountain Spotted Fever.]—*Mem. Inst. Butantan* **8** (1933–34) pp. 9–20, 5 graphs, 10 refs. São Paulo, 1934. [Recd. March 1935.]

Monteiro (J. Lemos). **Comportamento experimental do virus do " typho exanthematico " de S. Paulo após passagem pelo carrapato (*Amblyomma cajennense*).** [Experimental Behaviour of the Virus of S. Paulo Exanthematic Typhus after Passage through the Tick, *A. cayennense*.]—*T.c.* pp. 21–37, 12 graphs, 1 pl., 8 refs.

Monteiro (J. Lemos). **Comportamento experimental do coelho aos virus do " typho exanthematico de S. Paulo " e da febre maculosa das Montanhas Rochosas.** [The experimental Behaviour of the Rabbit to the Viruses of S. Paulo Exanthematic Typhus and of Rocky Mountain Spotted Fever.]—*T.c.* pp. 39–46, 1 pl., 3 graphs, 6 refs.

Monteiro (J. Lemos) & da Fonseca (F.). **Localização da *Rickettsia brasiliensis* nas cellulas dos diverticulos intestinaes do *Amblyomma cajennense*.** [The Localisation of *R. brasiliensis* in the Cells of the intestinal Diverticula of *A. cayennense*.]—*T.c.* pp. 47–56, 2 graphs, 3 pls., 5 refs.

Monteiro (J. Lemos). **Contribuição ao estudo das relações immunologicas entre o " typho exanthematico de Sao Paulo " e demais febres exanthematicas que occorrem na America do Sul.** [A Contribution to the Study of the immunological Relationships between S. Paulo Exanthematic Typhus and the other Exanthematic Fevers of South America.]—*T.c.* pp. 195–206, 5 graphs, 10 refs.

Monteiro (J. Lemos). **O " typho exanthematico de S. Paulo " e suas relações com a febre maculosa das Montanhas Rochosas, á luz das provas de immunidade cruzada.** [S. Paulo Exanthematic Typhus and its Relation to Rocky Mountain Spotted Fever in the Light of Cross-Immunity Experiments.]—*T.c.* pp. 207–220, 10 refs.

In the first of these papers, all of which have summaries in English, it is stated that a vaccine prepared from *Amblyomma cayennense*, F., infected with S. Paulo typhus and one from *Dermacentor venustus*, Banks (*andersoni*, Stiles) infected with Rocky Mountain spotted fever each conferred protection against both diseases [*cf. R.A.E.*, B **21** 262].

The second records that the passage of the virus of S. Paulo typhus through *A. cayennense* did not modify its essential characters, judging from its experimental behaviour and immunological relationships.

The third deals with the inoculation of rabbits. Certain differences enabled the virus of S. Paulo fever to be distinguished from that of Rocky Mountain spotted fever.

In the fourth paper it is reported that histological examination of *A. cayennense* infected with the virus of S. Paulo fever showed that *Rickettsia brasiliensis* entered the epithelial cells of the intestinal diverticula and other tissues and that its characteristic morphology could vary to some extent. As with Rocky Mountain fever, evolution of the virus occurred within the tick, there being infective and immunising stages.

The fifth paper describes experiments to test the protective power of sera from convalescents of typhus or petechial fever in Argentina, Chile and Bolivia against experimental S. Paulo spotted fever. The results seemed to justify the separation of these diseases into two groups, one including the petechial fever, epidemic typhus and American or endemic typhus, the other the known types of Rocky Mountain fever and S. Paulo fever.

The sixth paper records that as a result of cross-immunity tests [*cf.* **21** 276] S. Paulo fever and Rocky Mountain fever were found to belong to the same group.

SCHULZE (P.). **Acarina: Ixodoidea.**—*Wiss. Ergebn. niederl. Exped. Karakorum* Zool. pp. 178–186, 9 figs., 12 refs. Leipzig, 15th January 1935.

Ticks collected from the Karakorum Mountains, Kashmir, included *Rhipicephalus pumilio*, sp. n., *R. sanguineus*, Latr., *Hyalomma asiaticum* subsp. *citripes*, n., and *Dermacentor daghestanicus* subsp. *sillemi*, n. A key is given to the Asiatic species of *Rhipicephalus*. In connection with *D. daghestanicus sillemi*, the author discusses the identity of related species, among which there is great confusion. He considers that *D. pictus*, Hermann (1804), is a good species. Neumann, he thinks, confused both *pictus* and *marginatus*, Sulzer (1776), under the unavailable name *reticulatus*, F. (1794) [*cf. R.A.E.*, B **18** 20], and was wrong in making *niveus*, Neumann (1901), a variety of *reticulatus*. Further, Olenev's *daghestanicus* (1927), which Olenev himself made first a variety and then a synonym of *niveus*, is in the author's opinion a distinct species. In 1931 Olenev further confused *marginatus*, Sulz., with a distinct species under the new name *silvarum*. Thus in the author's opinion the species are *D. pictus*, Herm., *D. marginatus*, Sulz. (*silvarum* Olen. in part), *D. niveus*, Neum., *D. daghestanicus*, Olen. (*niveus* Olen. nec Neum.) and *D. silvarum*, Olen. *sens. str*.

[GOLOV (D. A.).] **Голов (Д. А.). On the Species and Biology of Ticks near the Town of Alma-Ata in Connection with the Epidemiology of Tularaemia.** [*In Russian.*]—*Meditz. Zh. Kazakstana* **1** no. 2–3 pp. 32–38, 8 refs. Alma-Ata, 1933. [Recd. February 1935.]

The water-rat, *Arvicola terrestris*, and the field-mouse, *Microtus arvalis*, which are very abundant in south-easterm Kazakstan, were heavily infested in 1932 by *Dermacentor silvarum*, Olen. [*cf* preceding paper] and *Ixodes apronophorus*, P.Sch. Since another water-rat,

A. amphibius, is a reservoir of tularaemia [*R.A.E.*, B **19** 85], investigations were carried out in 1933 from March to December on the bionomics of the ticks attacking *A. terrestris*, and on the possible means by which the disease is transmitted from one animal to another and to man. This rodent is infected by the larvae, nymphs and adults of *I. apronophorus*, but it seems that *Microtus* is normally attacked only by the immature stages. Only the larvae and nymphs of *D. silvarum* occurred on the animals.

The life-cycle of *I. apronophorus* may cover 2 or 3 years. A high degree of humidity is essential for its completion. The adults are especially abundant on *Arvicola* in April–June, after which their numbers decrease, though single individuals are found up to the end of October. Oviposition occurs at a temperature of about 20°C. [68°F.] and lasts from 16 to 35 days. Hatching begins in 20–39 days and continues for 10–18. The larvae survive unfed for nearly a year. Engorgement required 2½–8 days and metamophosis from larva to nymph 24–218 days. There were large numbers of larvae on the hosts from April to the end of October. Both nymphs and adults could survive unfed for over 400 days, and most of them only attack their hosts after hibernation. Nymphs engorged in 3–8 days, and adults in 5½–7. Nymphs collected in April, May and July transformed into adults in 52–140, 47–92 and 24 days, respectively, according to the temperature, but they may require as long as 311 days.

There were many adults of *D. silvarum* on cattle in spring [*cf.* **21** 273], and they were taken on man in March–May and September. Starved individuals placed on a calf engorged in 7–16 days. Pairing occurs on the host, and the males remain a long time on it and feed repeatedly. Oviposition began 2–23 days after engorgement and lasted 15–36 days. Hatching began in 11–26 days and continued for 15–18. Unfed larvae lived for 20–50 days, or several months in an ice-cellar. Engorgement requires 2–11 and 4–14 days, and metamorphosis 3–10 and 12–29 days for larvae and nymphs respectively. Nymphs survived without food for 9–27 days. Those that were only partly engorged could attack a new host. At room temperature young adults survived starvation for up to 417 days. In the field, they hibernate without having fed. The larvae attack water-rats and field-mice in June–July and the nymphs in June–August. The life-cycle is completed in a year, and development is favoured by great humidity.

The possible rôle of these ticks in the transmission of tularaemia is discussed.

Parker (R. R.). **Recent Studies of Tick-borne Diseases made at the United States Public Health Service at Hamilton, Montana.**—*Proc. Pan-Pacif. Sci. Congr.* **5** (1933) pp. 3367–3374. Toronto, 1934. [Recd. March 1935.]

Rocky Mountain spotted fever, Colorado tick fever and tularaemia are discussed with particular reference to the more recent observations made on them at the Laboratory at Hamilton, Montana. Much of the information on Rocky Mountain spotted fever [*R.A.E.*, B **21** 209, 238, etc.] and on Colorado tick fever [**19** 256] has already been noticed, but a certain number of the recent findings on tularaemia have not previously been published.

Tests have demonstrated the survival of *Bacterium tularense* from larvae to adults and to their offspring in both *Dermacentor variabilis*,

Say [*cf.* **22** 106] and *Haemaphysalis leporis-palustris*, Pack., and its transmission by successive stages; its survival from larva to adult in *Rhipicephalus sanguineus*, Latr., and *Amblyomma americanum*, L., and transmission by successive stages within one generation; and transmission by adults of *Dermacentor parumpertus marginatus*, Banks, and *D. reticulatus occidentalis*, Marx, that had previously fed on infected animals. It was also transmitted mechanically to guineapigs by *Tabanus septentrionalis*, Lw., a species tentatively identified as *T. rupestris*, McDunnough, and *Chrysops noctifer*, O. S., in which last fly it survived in a viable state for more than a month. It was transmitted by *Linognathoides* (*Neohaematopinus*) *laeviusculus*, Grube, the sucking louse of the Columbian ground squirrel [*Citellus columbianus*], and by means of immediate interrupted feeds by *Simulium decorum katmai*, Dyar & Shannon, but not by fleas occurring on the native fauna of Montana. It has been repeatedly recovered from *H. leporis-palustris* taken on rabbits and grouse in Minnesota during 1931 and 1932. Various wild animals and birds were shown to be susceptible to it. Its survival could not be demonstrated in blowfly larvae that had developed in the carcasses of infected animals, although mature larvae fed to or injected into experimental animals induced the formation of specific agglutinins. Faeces of *D. venustus*, Banks (*andersoni*, Stiles) remained infective for 20 days. Strains recovered from *D. venustus* and *H. leporis-palustris* have been found to vary considerably in virulence.

The results of these experiments suggest that ticks play an important part in the natural maintenance of *B. tularense*. Failure to show its survival from larva to adult and its transmission by successive stages and from female to progeny in all ticks has been due in some measure to lack of experience in rearing the species concerned, but chiefly to the death of the experimental ticks, particularly the adults, as a result of pathological conditions induced by the bacterium. This has been especially marked in certain species, particularly *A. americanum*, and least so in *D. venustus* and *H. leporis-palustris*.

HUGHES (A. W. McK.). **The Bed-bug as a Housing Problem.**—*J. R. sanit. Inst.* **55** no. 9 reprint 9 pp. London, 1935.

Much of the information contained in this discussion of the problem of bed-bugs [*Cimex lectularius*, L.] in houses in Britain is similar to that already noticed [*cf. R.A.E.*, B **22** 131]. To prevent infestation of new houses the tenant's furniture should be fumigated in transit with hydrocyanic acid gas or within a week of arrival. For the latter procedure a clearing house in which the tenants could spend the night would be necessary. Second-hand furniture should be bought before the move so that it may be fumigated with the rest; or, alternatively, it is suggested that a bye-law be passed with regard to its sale, since a large amount of re-infestation arises from this source. Fumigation with HCN involves the evacuation of the house for 24 hours and of those adjoining it for 7½ hours. It is useless to fumigate one or two houses in an infested row, since they are immediately re-infested from adjacent houses. Etox, which is almost as effective as HCN and costs about the same, is a mixture of ethylene oxide and carbon dioxide. It is not so toxic to man and can be used without adjacent houses being evacuated, but it is somewhat inflammable and explosive and cannot be used effectively at low temperatures. Sulphur at the rate of 6 lb.

per 1,000 cu. ft. applied twice at an interval of 3 weeks is effective in only about 85 per cent. of the cases. Mixtures of equal parts of orthodichlorobenzene with carbon tetrachloride or with light kerosene oil show promise as sprays, but gas masks must be used in applying them and the smell persists for nearly a week. Houses that are to be re-conditioned or pulled down should preferably be fumigated beforehand with HCN to eliminate bugs and prevent their dissemination in old building material Any fumigation must be accompanied by a cleanliness campaign or re-infestation will eventually occur.

PACHECHO (J. N.). **A simple Method of Bug Destruction.**—*Indian Med. Gaz.* **70** no. 2 pp. 75–76. Calcutta, February 1935.

In a hospital in India in which bed-bugs [*Cimex*] had persisted despite monthly treatment of the bedsteads and mosquito net fittings in boiling water and the disinfection of pillows, mattresses and mosquito nets with steam, they were gradually eradicated when these measures were carried out weekly and the bedsteads, etc., were painted with coconut oil. The junctions of the walls and floors were also painted with coconut oil, and the windows, doors, corners and crevices were sprayed with a 4 per cent. kerosene oil emulsion. The treatment was later reduced to wiping the bedsteads and fittings once a week with a rag dipped in coconut oil.

TWINN (C. R.). **A Summary of Insect Conditions in 1933.**—*Rep. ent. Soc. Ont. 1933* **64** pp. 62–80. Toronto, 1934.

These notes include records of a number of Arthropods attacking animals in Canada during 1933.

NASH (T. A. M.). **The Effect of High Maximum Temperatures upon the Longevity of** *Glossina submorsitans*, **Newst., and** *G. tachinoides*, **Westw.**—*Bull. ent. Res.* **26** pt. 1 pp. 103–113, 2 figs., 3 refs. London, March 1935.

These experiments on the effect of high maximum temperatures on *Glossina morsitans submorsitans*, Newst., and *G. tachinoides*, Newst., were carried out at Gadau, Northern Nigeria, from January to May 1934 in the course of an investigation on the seasonal longevity of the flies and its effect on the size of the fly populations.

The following is taken from the author's summary and conclusions: Newly emerged flies (0–1 day old) of both species were unaffected by daily maximum temperatures of 95–102°F., although the death of any weakly fly may possibly be accelerated by a temperature of 102·5°F. The critical zone for *G. tachinoides* is 103–105°F., but at the latter temperature 100 per cent. mortality is only assured if this maximum is maintained for about 100 minutes. The critical zone for *G. morsitans submorsitans* is 103·5–106°F. If the latter temperature is maintained for 60 minutes, 100 per cent. mortality occurs among young flies of both species. For flies over 10 days old, the critical zones are 102–105·5°F. for *G. tachinoides* and 102·5–106°F. for *G. morsitans submorsitans*. The sudden increase in mortality among tsetse flies on very hot days would appear to be directly due to the maximum temperature having

entered the critical zone, and not to excessively low humidity or very high evaporation. *G. tachinoides* is rather more susceptible to high maximum temperatures than is *G. morsitans submorsitans*, and the results also suggest that the former cannot withstand an exposure of long duration to high temperatures so well as the latter.

It has been shown that in open country the shade temperature on very hot days rises above the upper fatal limit for both species, and this alone would account for its evacuation by the flies in the dry season. In patches of dense riverine forest into which they retreat in the hot weather, the daily maximum temperatures are considerably lower, but even so they must be near the critical zone, and even allowing for the microclimates, fly can only survive on the hottest days by a very narrow margin. These results suggest the possibility that a slight modification of the vegetation might render the forest incapable of affording the protection required by *Glossina* at this season.

Evans (A. C.). **Some Notes on the Biology and Physiology of the Sheep Blowfly,** *Lucilia sericata*, **Meig.**—*Bull. ent. Res.* **26** pt. 1 pp. 115–122, 5 figs., 7 refs. London, March 1935.

Observations on the various internal processes that occur in the first few days of life of the adults of *Lucilia sericata*, Mg., are described. The growth of the adult fat-body and ovaries was studied in relation to diet and to the abdominal air-sacs.

The following is taken from the author's summary : Unfed flies and flies fed on meat and water or water alone lost weight. Males fed on meat, sugar and water, or on sugar and water, increased in weight rapidly during the first day of adult life and then lost weight until they died. Females fed on sugar and water increased in weight rapidly for the first day and then more slowly until the twelfth day, after which they lost weight until death occurred. A similar rapid increase in weight on the first day occurred in females fed on meat, sugar and water, but a second period of rapid increase occurred between the fourth and sixth days. The first period corresponds to the growth of the imaginal fat-body and the second to the growth of the ovaries. The percentage dry weight of flies fed on meat, sugar and water, or on sugar and water, increased rapidly at first but subsequently decreased slowly until death. The disappearance of the pupal fat-body cells and the growth of the imaginal fat-body on several diets are described. It is suggested that the inclusions of the pupal fat-body cells are transferred to the rapidly growing imaginal fat-body. The hypothesis is put forward that the abdominal air-sacs in flies of the Muscid type have little respiratory function and are chiefly concerned in preserving the increased volume of the newly emerged fly and in providing ample space within the abdomen for the growth of the imaginal fat-body in the male and of the fat-body and ovaries in the female.

Papers noticed by Title only.

Li (Feng-swen) & Wu (Shih-cheng). **On the Known Species of Chinese Culicini, with a few Species of other Tribes** [with keys]. [*In Chinese.*]—*Ent. & Phytopath.* **3** no. 3–5 pp. 44–98, 5 figs., 106 refs. Hangchow, 11th February 1935.

Komp (W. H. W.). **Notes on the Validity of the Types of the Species in the Subgenera** *Mochlostyrax* **and** *Melanoconion* [of *Culex*] **in the U.S. National Museum (Diptera, Culicidae).**—*Proc. ent. Soc. Wash.* **37** no. 1 pp. 1–11. Washington, D.C., 1935.

Prado (A.). **Contribuições as conhecimento dos culicideos de S. Paulo. V. Synopse das especies de** *Mansonia*. [Contributions to the Knowledge of the Culicids of S. Paulo. V. Synopsis of the Species of *Mansonia*.]—*Mem. Inst. Butantan* **8** (1933–34) pp. 1–8, 1 pl. S. Paulo, 1934. (With a Summary in English.) [Recd. March 1935.] [*Cf. R.A.E.*, B **21** 209.]

Sautet (J.). **Contribution à l'étude du tube digestif des larves d'***Anopheles* **et de** *Theobaldia*. **(Note préliminaire I.)**—*Ann. Parasit. hum. comp.* **13** no. 2 pp. 97–108, 9 figs., 4 refs. Paris, 1st March 1935.

Stone (A.). **Notes on Tabanidae (Diptera)** [including 6 new species and 1 new subspecies from U.S.A.].—*Proc. ent. Soc. Wash.* **37** no. 1 pp. 11–21, 6 figs., 12 refs. Washington, D.C., 1935.

Rau (P.). **The Egg-laying of the Mourning Horse-fly,** *Tabanus atratus* **Fab.**—*Bull. Brooklyn ent. Soc.* **30** no. 1 p. 26, 1 fig. Brooklyn, N.Y., February 1935.

Raynal (J.) & Gaschen (H.). **Sur les phlébotomes d'Indochine. V. Présence de** *Phlebotomus barraudi*, **Sinton 1929, dans le Haut-Bassin du Fleuve-Rouge** [Yunnan] **et description de** *Phlebotomus barraudi* ♂.—*Bull. Soc. Path. exot.* **28** no. 2 pp. 113–118, 4 figs., 2 refs. Paris, 1935. [*Cf. R.A.E.*, B **23** 129.]

da Fonseca (F.). **Ainda sôbre a fixação dos ♂♂ do carrapato** *Amblyomma longirostre* **(Koch 1844) aos espinhos de** *Coendu prehensilis*. [A further Note on the Attachment of the Males of the Tick *A. longirostre* to the Quills of the Porcupine, *C. prehensilis* (previously misidentified as *C. villosus*).]—*Bol. biol.* N.S. **2** no. 1 pp. 16–17. S. Paulo, June 1934. [Recd. March 1935.] [*Cf. R.A.E.*, B **22** 119, 160.]

Faasch (W. J.). **Darmkanal und Blutverdauung bei Aphanipteren.** [Digestive Tract and Digestion of Blood in Fleas.]—*Z. Morph. Oekol. Tiere* **29** no. 4 pp. 559–584, 29 figs., 24 refs. Berlin, 22nd March 1935.

Hull (J. E.). **Concerning British Analgidae. (Feather Mites.)**—*Trans. north. Nat. Un.* **1** no. 3 pp. 200–206, 3 figs. Newcastle-upon-Tyne, 12th November 1934.

Roberts (F. H. S.). **Parasites of the Dog and Cat** [in Queensland; a popular account].—*Qd agric. J.* **43** pt. 1 pp. 18–35, 11 figs. Brisbane, January 1935.

von Ihering (R.). **Diccionario dos Animaes do Brasil** [including popular names of Arthropods].—*Bol. Agric.* **32** pp. 291–379; **33** pp. 197–264; **34** (1933) pp. 512–599, illus. São Paulo, 1931, 1932, 1934.

de Bussy (L. P.), van der Laan (P. A.) & Jacobi (E. F.). **Resultaten van proeven met Derrispoeder en rotenon op Nederlandsche insecten.** [Results of Tests with Derris Powder and Rotenone on Netherlands Insects.]—*Tijdschr. PflZiekt.* **41** no. 2 pp. 33–50, 2 pls., 15 refs. Wageningen, February 1935.

The tests described in this paper included some against blood-sucking insects. Derris is now an established remedy against warble-flies [*Hypoderma bovis*, DeG.] on cattle [*R.A.E.*, B **22** 152]. *Cimex lectularius*, L., proved quite insensitive to rotenone and to derris powder. At Utrecht, Klarenbeek and others investigated the effect of derris on parasites of dogs, cats and foxes, and found the powder to be excellent against *Linognathus* (*Haematopinus*) *piliferus*, Burm., and *Trichodectes latus*, Nitzsch, on dogs, while the prospects of employing it against mange mites appeared good. Using derris with a 2 per cent. rotenone content, they advised that a watery extract be made by boiling the powder in 300 parts water for half an hour, the addition of a little soap promoting contact with the skin. The derris powder, mixed with 40 parts French chalk may be rubbed in and gives satisfactory results, especially against fleas.

The authors freed dogs from *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., by rubbing in a derris powder with an 8 per cent. content of rotenone at the rate of 1 part to 160. *Pulex irritans*, L., was much more resistant.

Thomsen (M.). **Ueber die Organisation der angewandten Entomologie in Dänemark.** [On the Organisation of applied Entomology in Denmark.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 1 pp. 52–55. Berlin, February 1935.

This paper contains a note on the work done in Denmark for the control of *Hypoderma bovis*, DeG., and *H. lineatum*, Vill., on cattle [*cf. R.A.E.*, B **16** 228], which reduced injury to hides from 23 per cent. in 1922 to 3 per cent. in 1932, and even to 0·1 per cent. in the Danish islands.

Piekarski (G.). **Eine einfache Vorrichtung zur Fütterung blutsaugender Arthropoden an Warmblütlern.** [A simple Contrivance for feeding blood-sucking Arthropods on Warm-blooded Animals.]—*Zbl. Bakt.* **133** (Orig.) no. 7–8 pp. 470–471, 2 figs. Jena, 18th March 1935.

A circular glass cover about 1¼ inch in diameter confines the Arthropods on the skin of the animal. A cap of black fabric covers this glass and holds it closely to the host by means of a rubber strap about an inch wide. This strap, which is perforated with holes at intervals, is attached by one end to the cap and after passing round the animal, or round a limb, is secured to a button on a tab at the other edge of the cap.

Nieschulz (O.), Bedford (G. A. H.) & du Toit (R. M.). **Investigation into the Transmission of Horse-sickness at Onderstepoort during the Season 1931–1932.**—*Onderstepoort J. vet. Sci.* **3** no. 2 pp. 275–334, 3 charts, 8 refs. Pretoria, October 1934. [Recd. March 1935.]

The following is taken from the author's summary: During the latter part of the summer of 1931–1932 and during the winter of 1932

experiments in connection with the natural transmission of horse-sickness were carried out at Onderstepoort, using a laboratory strain of the virus and three strains from cases of the disease in the field. The season was unfavourable on account of a shortage of rain. Previous work [*R.A.E.*, B **22** 263] having indicated that species of *Aëdes* were the most likely vectors, 35 experiments were carried out in which over 4,500 mosquitos, chiefly of this genus, were fed on experimentally infected horses and either injected into or fed on susceptible horses at intervals varying from ½ to 65 days in the first case and 1 minute to 62 days in the second. The numbers used in the two series respectively were 245 and 9 *Culex theileri*, Theo., 485 and 190 *Aëdes caballus*, Theo., 287 and 207 *A. lineatopennis*, Ludl., 328 and 187 *A. hirsutus*, Theo., 28 and 102 *A. dentatus*, Theo., and 52 and 9 *A. vittatus*, Big. In the injection series 5 *Anopheles squamosus*, Theo., 2 *Aëdes punctothoracis*, Theo., and 1 *A. cumminsi*, Theo., were also used. Only three experiments gave positive results. In the first, 5 *Culex theileri* were injected ½ day after their infecting feed, indicating that sufficient virus had been taken up by this number of mosquitos. In the second, 85 *Aëdes caballus*, 94 *A. lineatopennis* and 115 *A. hirsutus* were injected after 6 days, and in the third 68 *A. caballus* and 66 *A. lineatopennis* after 7 days, indicating that the virus might remain alive for periods up to one week. The failure to obtain transmission after longer intervals suggests that the virus is usually rapidly destroyed in species of *Aëdes*. The laboratory strain of virus had been passed directly from horse to horse since its isolation 30 years previously and so may have lost at least part of its capacity to develop in insects, and in the field cases from which the three other strains were derived a history of immunisation with the laboratory strain against horse-sickness existed, so that it is possible that all the work was done with the one strain of virus. For these reasons no definite conclusion can be arrived at, but it appears probable that species of *Aëdes* are not the vectors of the disease.

Brumpt (E.). **Présentation de deux** *Ornithodorus canestrinii* **Bir., 1895, vivants originaires d'Ispahan (Perse).**—*Bull. Soc. Path. exot.* **28** no. 2 pp. 51–53. Paris, 1935.

The author records the finding in a caravanserai of Ispahan of two females and one male of *Ornithodorus canestrinii*, Bir., which has not been found since it was described in 1895 from specimens collected in 1839 in Persia and 1885 in the Caucasus. On arrival in Paris the male was dead but the two females are living and have engorged on a guineapig infected with *Spirochaeta persica* (*uzbekistanica, sogdiana*).

Roubaud (E.). **Variété nouvelle de l'***Anopheles maculipennis* **au Maroc,** *A. maculipennis sicaulti* **(n. var.).**—*Bull. Soc. Path. exot.* **28** no. 2 pp. 107–111, 2 pls., 7 refs. Paris, 1935.

Descriptions are given of the distinguishing characters of the eggs, larvae and adults of *Anopheles maculipennis* var. *sicaulti*, n., a race found in Morocco that is closely allied to var. *labranchiae*, Flni. It is eurygamic, homodynamic and paucidentate, and in feeding experiments it was found to prefer man to guineapig.

Gaschen (H.). **Sur un nouvel agent transmetteur du paludisme en Indochine septentrionale** *Anopheles culicifacies* **Giles 1901.**—*Bull. Soc. Path. exot.* **28** no. 2 pp. 111–113, 10 refs. Paris, 1935.

The finding at Lahati, Yunnan, of an example of *Anopheles culicifacies*, Giles, with two malaria cysts in its stomach [*R.A.E.*, B **23** 129], suggests that it may be a vector of malaria in Indo-China, where it has been recorded from Annam, Laos and Tonkin. Its breeding places are less well defined than those of *A. minimus*, Theo., and failure to control malaria in localities where measures are directed chiefly against the breeding places of the latter may be explained by the fact that *A. culicifacies* is the vector.

Sicault (G.) & Roule (S.). **Note sur la biologie du** *Gambusia holbrooki* **au Maroc.**—*Bull. Soc. Path. exot.* **28** no. 2 pp. 134–141. Paris, 1935.

Observations have shown that *Gambusia holbrooki* multiplies and spreads rapidly in marshes on the coast of Morocco. It effectively controls Anopheline larvae during the hot season (August–October) when its numbers are sufficient (about 17 per square yard). In the spring and autumn, when the temperature of the air falls below 5°C. [41°F.], it apparently leaves the shallow water for the deeper water where the temperature does not fluctuate so rapidly. Larvae of *Anopheles maculipennis*, Mg., were found to develop in water at lower temperatures, and they therefore occur in large numbers in shallow water at these seasons of the year.

Pitti-Ferrandi (F.) & Sautet (J.). **Anophélisme sans paludisme dans un village corse de montagne.**—*Rev. Méd. Hyg. trop.* **26** no. 6 pp. 262–267, 2 refs. Paris, 1934. [Recd. March 1935.]

During recent years the incidence of malaria in a mountain village of Corsica has gradually diminished, and since 1925 no locally contracted cases have been observed. Possible explanations of this are discussed. Larvae of both *Anopheles maculipennis*, Mg., and *A. claviger*, Mg. (*bifurcatus*, auct.) were found in the stream and reservoirs of the village at the rate of about 125 per square yard in September 1934, but no adults were found in houses and extremely few in animal shelters. It is possible that they feed on the large number of domestic animals that are allowed to roam free. In the past, large numbers of infected men returned to the village after harvesting in the malarious valley below. This occupation has disappeared, and the intensive administration of quinine during the last 22 years has further reduced the reservoir of the disease.

Hu (S. M. K.) & Yen (C. H.). **Studies on the Comparative Susceptibility of** *Culex pipiens* **var.** *pallens* **Coquillet and** *Culex fatigans* **Wiedemann to Experimental Infection with** *Wuchereria bancrofti* **Cobbold.**—*Trans. 9th Congr. Far-East. Ass. trop. Med.* **1** pp. 483–490, 12 refs. Nanking, 1934.

The experiments described were carried out to compare the susceptibility to *Filaria* (*Wuchereria*) *bancrofti* of *Culex pipiens* var. *pallens*, Coq., from the Shanghai area and *C. fatigans*, Wied., from Foochow in southern China. Mosquitos of both species bred in the laboratory were

allowed to feed at the same time on a patient whose blood contained many microfilariae. The filarial larvae were found to complete their development to the infective stage in about the same time in both species but the approximate period varied from 20 days at the beginning of May to 11–12 at the beginning of June. Of the mosquitos that survived the incubation period, 90·1 per cent. of 61 examples of *C. pipiens* var. *pallens* and 94·5 per cent. of 92 of *C. fatigans* harboured infective filarial larvae. Larvae that were not able to complete their development to the infective stage were present in both species, sometimes in association with living infective larvae. Among mosquitos harbouring only living infective larvae, the average number was 14·4 in *C. pipiens* var. *pallens* and 7·3 in *C. fatigans*. The higher percentages of infection in both species when compared with those obtained in previous experiments may be accounted for in the case of *C. pipiens* var. *pallens* [*cf. R.A.E.*, B **22** 104] by the greater number of microfilariae in the blood of the patient on which the mosquitos were fed, and in the case of *C. fatigans* [*cf.* **23** 116] by seasonal variation, the mean temperature in the incubation room being higher and the range of mean humidity greater than in April–May when the earlier experiments were carried out.

Trausmiller (O.). **Le paludisme dans les îles de l'Adriatique : Krk, Rab et Pag.**—*Bull. Off. int. Hyg. publ.* **27** no. 2 pp. 291–303, 1 pl., 2 maps. Paris, February 1935.

An account is given of the malaria situation in three islands in the northern Adriatic off the coast of Jugoslavia. Two are partly, and one entirely, dependent for water on natural or artificial reservoirs, which serve as breeding places for *Anopheles maculipennis*, Mg., the principal vector of malaria, *A. claviger*, Mg. (*bifurcatus*, auct.) and *A. sacharovi*, Favr (*elutus*, Edw.). Breeding has been controlled by the introduction of *Gambusia* into these reservoirs. In a village bounded on the west by the sea and on the north and east by plains in which there are no reservoirs, the cattle, which are not allowed to be kept in the village, are stabled to the south between the houses and the nearest reservoirs, with the result that Anophelines are rarely found in the village. Where streams occur, systematic drainage, the application of Paris green, and the administration of atebrin combined with plasmochin have considerably reduced the malaria incidence. Anopheline breeding in a marshy lake was also controlled successfully by the introduction of *Gambusia*, showing that under favourable conditions these fish may be used to protect large water surfaces.

Moreira (J. A.) & de Magalhães (O.). **Typhus exantematicos em Minas Geraes.**—*Brazil-med.* **47** pp. 599–601, 5 charts. Rio de Janeiro, 1933.

Moreira (J. A.) & de Magalhães (O.). **Typhus exantematico em Minas Gerais.**—*Mem. Inst. Osw. Cruz* **28** fasc. 2 pp. 225–234, 2 pls., 8 charts. Rio de Janeiro, 1934.

Monteiro (J. L.). **Essais de transmission expérimentale du typhus exanthématique de São Paulo par la punaise** *Cimex lectularius*.—*C. R. Soc. Biol.* **118** no. 9 pp. 918–920, 3 refs. Paris, 1935.

In the course of work on the typhus virus of Minas Geraes, described in the first two papers, the authors found infected bugs (*Cimex*) in beds

recently used by persons suffering from the disease ; they carried out experiments in which guineapigs bitten by or inoculated with a suspension of bed-bugs that had fed on infected guineapigs became infected ; and they demonstrated by inoculation the occurrence of the virus in the eggs and larvae of infected females. They concluded that bed-bugs are the natural vector of the typhus of Minas Geraes.

In view of these observations, the experiments described in the third paper were undertaken to determine whether *Cimex lectularius*, L., could transmit the virus of São Paulo typhus. No infection had previously been found in this bug in São Paulo [*R.A.E.*, B **21** 67].

Larvae, nymphs and adults were fed on infected rabbits or guineapigs. The activity of the virus was tested by the inoculation, immediately after feeding, of a number of the engorged bugs. After varying periods, guineapigs were inoculated either with suspensions of some of the other bugs or with the excreta scraped from the side of the flasks in which they had been kept. The rest of the bugs were fed on normal guineapigs to test their ability to transmit the virus by biting. The virus was found to be active immediately after its ingestion by the bugs, but it became inactive after 24 hours. Negative results were obtained in all tests after periods of 2–25 days.

It therefore appears that the typhus of Minas Geraes differs from diseases of the Rocky Mountain spotted fever group, to which São Paulo typhus belongs. It may be similar to the endemic typhus of Mexico, which is transmitted by fleas, or may be a new form of typhus with a new vector, or a distinct disease.

RONSE (M.). **Contribution à l'étude du typhus exanthématique.**—*Ann. Inst. Pasteur* **54** no. 3 pp. 341–382, 7 figs., many refs. Paris, March 1935.

The author describes observations on a strain of murine typhus recently isolated from rats at Antwerp. In the course of tests to determine the susceptibility to infection of rodents and other animals, the ectoparasites of the susceptible animals were collected. The fleas from hedgehogs were only found infected in one case, and none of their ticks contained the virus. The Gamasids from *Micromys* (*Mus*) *minutus* were not found to be infective. The injection of these mites into guineapigs was often followed by a rise in temperature, and care must be taken not to confuse this reaction with that in typhus. *Rickettsia prowazeki* was frequently found in lice taken from infected animals, and when a suspension of other lice taken at the same time was injected into guineapigs a typical infection resulted. No rickettsiae were seen in fleas, whether taken on mice, dormice or hedgehogs, although these animals were proved to be infected. On the other hand, in smears made from macerated mites taken from *Micromys* typical rickettsiae were prevalent, although the disease was never transmitted by them. It is possible that these rickettsiae were not those of typhus.

SOESILO (R.). *A. barbirostris* **v. d. Wulp, 1884, als malariaoverbrengster op het Maleische schiereiland.** [*A. barbirostris* as a Vector of Malaria in the Malay Peninsula.]—*Geneesk. Tijdschr. Ned.-Ind.* **75** no. 4 pp. 383–384. Batavia, 19th February 1935.

In the Netherlands Indies, *Anopheles barbirostris*, Wulp, appears to be of minor importance in the transmission of malaria, probably because

it is zoophilous, and hitherto no epidemic due mainly to it has been recorded. Attention is therefore drawn to a report of its being concerned in an outbreak of malaria in Malaya [*R.A.E.*, B **23** 61].

Macfie (J. W. S.). **Ceratopogonidae (Dipt.) from the River Amazon.**—*Stylops* **4** pp. 49–56, 3 figs., 1 ref.; correction p. 89. London, March and April 1935.

Records are given of Ceratopogonids collected on a steamer lying off Tutoia, Brazil, and 10 new species are described. In the correction it is stated that Tutoia is on the coast near Parnahyba and not on the Amazon.

Soper (F. L.). **El problema de la fiebre amarilla en America.** [The Problem of Yellow Fever in America.]—*Bol. Ofic. sanit. pan-amer.* **14** no. 3 pp. 203–213, 1 ref. Washington, D.C., March 1935.

Work on the incidence of yellow fever in South America during the period 1929–34 is reviewed. Although no epidemics seem to have occurred in any of the important ports of the American continent, the disease still exists in the rural areas of north-eastern Brazil, in various widely separated points in the Amazon Valley in Brazil, Peru and Bolivia, and in the Magdalena and Orinoco Valleys in Colombia. Cases have occurred in Brazil [*cf. R.A.E.*, B **22** 72], Peru, Bolivia, and probably Colombia, in localities where *Aëdes* (*Stegomyia*) *aegypti*, L., has not been found. Moreover the disease exists in places where the population is so small and scattered as to suggest the presence of a vertebrate host other than man. It has also occurred at irregular intervals over a period of several years in areas where the population is relatively small, under conditions that suggest the existence of vectors of greater longevity than mosquitos.

Gil Collado (J.). **Nuevos datos sobre la distribución del** *Aëdes* (*Stegomyia*) *vittatus* **en España, con algunas notas acerca de su biología.** [New Data on the Distribution of *A. vittatus* in Spain, with some Notes on its Biology.]—*Med. Países cálidos* **8** no. 1 pp. 61–64, 11 refs. Madrid, 31st January 1935.

The distribution in Spain of *Aëdes vittatus*, Big., an experimental vector of yellow fever [*R.A.E.*, B **17** 213], is given from observations in 1925, 1927, 1931, and 1934. In 1934 both larvae and adults were observed in the provinces of Cáceres and Segovia in the second half of September and throughout October. Unlike *A. aegypti*, L., the adults occurred at a distance from dwellings. In a place sheltered against wind they attacked man very readily in the evening and in full sunshine.

The larvae were only found in holes in rocks [*cf. loc. cit.*], usually small but fairly deep, so that the water did not dry up. Though quite free from vegetation, the holes contained much decomposing matter.

A. vittatus was found in widely separated localities and at heights from a little above sea-level to about 3,600 ft.; it probably occurs in all the mountain region of central and southern Spain. It seems difficult to believe that there is only one annual generation, developing in autumn, for if the eggs overwintered in rock holes they would be swept out by water in spring, and if the adults hibernated they would

have to be able to resist frost. It is possible that the autumn adults may oviposit in holes in trees, and that adults of a spring generation oviposit in the holes in rocks.

Bergonzini (M.) & Yang (Li-jen). **La zanzara** *Stegomya* **quale agente vettore di infezioni da streptococchi.** [The *Stegomyia* Mosquito as a Vector of streptococcic Infections.]—*Boll. Soc. ital. Biol. sper.* **10** no. 2 pp. 136–138. Milan, February 1935.

In the lower Yangtsze valley there is a common form of persistent ulcer usually occurring on the arms and legs. Experiments suggest that these ulcers may originate from the bites of mosquitos of the subgenus *Stegomyia*. Streptococci similar to those in the ulcers were obtained in 2 per cent. of cultures sown with the digestive canal of *Aëdes aegypti*, L. (*Stegomyia fasciata*, F.) in a medium of human blood and agar. Individuals caged over an ulcerous arm were observed to feed on the purulent matter in the ulcers instead of sucking blood.

[**Mosquito Control Work in 1933.**]—*Proc. N. J. Mosq. Ext. Ass.* **21** 158 pp., 8 pls., refs. New Brunswick, N.J., 1934. [Recd. April 1935.]

In addition to reports on local mosquito situations and control work in New Jersey, Florida, Alabama, Mississipi, Massachusetts, Long Island, Delaware, and Connecticut, the following papers are included: Résumé of Mosquito Work throughout the World in 1933, by F. C. Bishopp and C. N. Smith (pp. 37–66), Mosquito Work of the Civil Works Administration throughout the Country, by L. W. Smith (pp. 69–75), Mosquito Suppression Work in Canada in 1933, by A. Gibson (pp. 102–112), Mosquito Larvicides, by J. M. Ginsburg (pp. 121–127), and a New Development in Mosquito Traps, by T. D. Mulhern (pp. 137–140).

The information by Ginsburg on the preparation of pyrethrum larvicide is similar to that already noticed [*R.A.E.*, B **23** 25], but the formula for the concentrated emulsion for use on fresh water is 2 U.S. gals. kerosene-pyrethrum extract (1 lb. of flowers to the U.S. gallon) 1 U.S. gal. water and 8 oz. 40 per cent. liquid coconut oil soap, and that for water with a salinity of more than 5 per cent. is 2 U.S. gals. kerosene-pyrethrum extract, 2 oz. cresylic acid, 1 lb. powdered skim milk and 1 U.S. gal. water. Investigations carried out during 1932 and 1933 showed that this larvicide, which costs considerably less and is more pleasant to use than oil, is as effective as the latter when applied to breeding places in clear fresh or salt water, ornamental ponds, swimming pools, catch basins and filter beds with no scum, but is less effective than oil on water covered with dense vegetation, débris or scum, on filter beds heavily charged with sewage and scum, or in places where the more lasting effect of the oil is essential. Experiments to test the toxicity of soap to mosquito larvae have already been noticed [**22** 87].

The cheaper and more convenient suction light trap for mosquitos described in the paper by Mulhern was evolved with a view to eliminating defects in the earlier type of trap [**20** 241]. The metal cylinder containing the fan and a funnel-shaped screen leading into a cyanide jar, is attached in a vertical position beneath a conical roof, painted white inside, in the centre of which is attached the electric light bulb. The upper end of the cylinder is covered with $\frac{1}{4}$ inch mesh screen to

exclude large insects. The roof prevents rain from flooding the cyanide jar and injuring the specimens caught, and also acts as a reflector. A ring for hanging the trap is attached to the apex of the roof. The mosquitos are attracted by the radiating light rays regardless of the direction in which they are being carried by the wind, and are caught up when within about 12–14 inches of the light by a current of air, which carries them through the open space between the eaves of the roof and the top of the tube and then down through the tube and the funnel into the cyanide jar. The advantages of the new traps over the old were proved by the satisfactory operation of 41 during 1933.

HACKETT (L. W.) & MISSIROLI (A.). **Les variétés d'*Anopheles maculipennis* et leur relation avec la distribution du paludisme en Europe.**—*Med. Países cálidos* **8** no. 1 pp. 1–60, 4 pls., 4 pp. refs. Madrid, January 1935. **The Varieties of *Anopheles maculipennis* and their Relation to the Distribution of Malaria in Europe.**—*Riv. Malariol.* **14** fasc. 1 pp. 45–109, 4 pls., 4 pp. refs. Rome, 1935. (With a Summary in Italian.)

CHRISTOPHERS (R.), HACKETT (L. W.), JAMES (S. P.), MISSIROLI (A.), PITTALUGA (G.), SERGENT (Ed.) & SWELLENGREBEL (N. H.). **A Brief Guide to the Varieties of *Anopheles maculipennis*.**—*Quart. Bull. Hlth Org. L.o.N.* **3** no. 4 pp. 654–661, 2 pls. Geneva, December 1934. (Also in Italian in *Riv. Malariol.* **14** fasc. 1 pp. 110–115, 2 pls. Rome, 1935.)

In the first two papers, which are almost identical, a detailed account is given of the history of the discovery of the different races of *Anopheles maculipennis*, Mg., the morphological and biological characters by which they may be distinguished, their geographical distribution, and their relation to malaria [*cf. R.A.E.*, B **22** 200, etc.]. The races recognised are the typical *A. maculipennis*, var. *atroparvus*, van Thiel, var. *messeae*, Flni., var. *melanoon*, Hackett, and var. *labranchiae*, Flni.; *A. sacharovi*, Favr (*elutus* Edw.) is included since it is a closely allied species. Information on the technique of collecting and of preserving and mailing eggs is given in the first two appendices. The last consists of records of the occurrence of *A. sacharovi* in Europe and Palestine and of the races of *A. maculipennis* in Europe and Algeria, showing the date, the observer and, where possible, the number caught.

The third paper, which is the outcome of the discussion of this preliminary report and includes data submitted by various other workers in Europe and Algeria, gives a provisional key to the forms mentioned, a brief account of their habits, and notes on their relation to malaria. Their eggs are illustrated and their distribution is shown on small maps.

SERGENT (Et.) & TRENSZ (F.). **Premières études sur les races d'*Anopheles maculipennis* en France et en Algérie (1933).**—*Arch. Inst. Pasteur Algérie* **13** no. 1 pp. 1–10, 1 pl., 8 refs. Algiers, 1935.

A study of the eggs of the races of *Anopheles maculipennis*, Mg., showed that in certain localities in France that were once malarious but are now free from the disease the races (apart from one batch of eggs of var. *melanoon*, Hackett) were *maculipennis* (*typicus*), var. *atroparvus*, van Thiel, and var. *messeae*, Flni., all of which are considered to be more or less exclusively zoophilous, whereas in Algeria,

in localities that are still malarious, the only race was var. *labranchiae*, Flni., which attacks man or animals indiscriminately. From an examination of several hundred Anophelines it was found that the maxillary index of var. *labranchiae* from Algeria is 14·5, of var. *atroparvus* from Limousin 16·7, and of var. *messeae* from Alsace 15·6. On further examination, eggs of Anophelines from a locality in the department of Corrèze (Limousin) were identified as those of var. *atroparvus* and not of var. *labranchiae* as was previously stated [*cf. R.A.E.*, B, **21** 169].

LI (Feng-swen) & WU (Shih-cheng). **The Mosquitoes of Hangchow, Chekiang.**—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 97–123, 9 figs., 2 pp. refs. Hangchow, 1934. [Recd. April 1935.]

The 27 species of mosquitos that have been taken in Hangchow include 4 Anophelines [*cf. R.A.E.*, B **22** 7]. Their synonymy, distinguishing characters and distribution are given, together with records by other authors of their relation to disease in various parts of the world.

LI (Feng-swen) & WU (Shih-cheng). **The Observations of the Life History of *Anopheles hyrcanus* var. *sinensis* and an Investigation of Mosquitoes in the Mosquito-Net.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* **3** (1933) pp. 154–162, 2 figs. Hangchow, 1934. (With a Summary in English.) [Recd. April 1935.]

Anopheles hyrcanus var. *sinensis*, Wied., which is an important vector of malaria and filariasis in China, was reared in the laboratory in water containing *Spirogyra* and during 1933 completed 11 generations. At about 78°F., the egg, larval and pupal periods of the majority of individuals lasted 2·3, 12·4 and 1·6 days respectively. At 74·6°F. the average number of eggs deposited by a single female was 197. About 90 per cent. of the females oviposited once only, 9 per cent. twice and 1 per cent. 3 times. Under natural conditions the numbers of males and females are equal. The adult females alone survive the winter.

SALEUN (G.) & MONIER (H. M.). **Renseignements et techniques particulières recueillis à l'école italienne de malariologie.**—*Ann. Méd. Pharm. colon.* **32** no. 4 pp. 472–493. Paris, 1934. [Recd. April 1935.]

Descriptions are given of methods used for determining the origin of the blood in Anophelines, for keeping living infected mosquitos, for rapidly examining salivary glands, for fixing and mounting stomachs and salivary glands, and for determining the presence of barium oxide in Paris green and of Paris green in water.

TULLOCH (G. S.). **Mosquito Investigations in Alaska.**—*Psyche* **41** no. 4 pp. 201–210, 4 figs. Cambridge, Mass., December 1934.

During the summer of 1931 investigations were undertaken on the mosquitos in an area forming part of the central plateau of Alaska, with a view to discovering practical control measures that would reduce the annoyance caused to men engaged in gold mining. *Anopheles maculipennis*, Mg., was the only Anopheline taken. *Theobaldia* (*Culiseta*) *alaskaensis*, Ludl., which sometimes attacked man, and *Culex apicalis*, Adams, bred in prospect shafts and permanent swampy

areas, but the most troublesome species, particularly *Aëdes punctor*, Kirby, *A. communis*, DeG., *A. lateralis*, Mg. (*aldrichi*, D. & K.), and *A. stimulans*, Wlk., developed in temporary pools formed by the melting of snow and the thawing of the frozen ground and possibly, in some seasons, by rain. The measures recommended include the removal of dead grass and moss covering pools, since this vegetation retards evaporation and impedes oiling, the oiling and draining of pools within 500 yards of mining operations, and the use of copper sulphate as a larvicide.

TWINN (C. R.) & HAY (A. K.). **Report on Mosquito Control in the Ottawa District, 1934.**—4to, 15 pp. multigraph. Ottawa, December 1934. [Recd. April 1935.]

During 1927–29 measures against mosquitos were carried out by the Mosquito Control Committee of the Ottawa District [*cf. R.A.E.*, B **18** 181]. In the next four years no control work was carried out, and in 1930–32 no important outbreaks occurred, owing to the absence of river floods, to a succession of warm dry summers, and probably also to the effect of oiling in the preceding years [*cf.* **21** 153].

In 1933 a moderately severe outbreak developed, largely because the river floods formed extensive breeding places for the flood-water mosquito, *Aëdes sticticus*, Mg. (*hirsuteron*, Theo.). The large numbers of eggs laid gave rise to the more severe outbreak that occurred in 1934. The melting of the deep snow, resulting from a phenomenally cold and prolonged winter, caused a material rise in the Ottawa River and consequently extensive floods. The larvae of *A. sticticus* and other mosquitos developed from eggs laid in the previous seasons. A sudden warm spell in May hastened mosquito development, and in one area of concentrated infestation the numbers of larvae and pupae averaged approximately 20,000 per square foot of shallow water. Adult mosquitos emerged in late May and early June. The rainfall in March and April was about twice as heavy as usual, and large numbers of mosquitos, particularly *A. stimulans*, Wlk., developed in the pools of snow- and rain-water. The rain-pool mosquito, *A. vexans*, Mg., occurred in only comparatively small numbers, owing largely to the subnormal precipitation during May–August 1934. The application of oil to breeding places reduced a potentially enormous outbreak to one of minor proportions. Collections of adults in June showed that 58 per cent. were *A. sticticus* and the remainder chiefly *A. stimulans*. Statistics on the flooding of the River indicate that flood-water mosquitos may be expected to be a serious pest in three out of every five years, the most severe outbreaks occurring when floods are followed by a wet summer. Permanent measures such as draining and filling should be carried out wherever possible, and the underbrush that is found over a considerable part of the breeding areas should be removed to facilitate oiling.

In the second part of the paper, A. K. Hay discusses the organisation and cost of the control measures undertaken.

Sur la destruction des moustiques à bord des aéronefs.—*Bull. Off. int. Hyg. publ.* **27** no. 3 pp. 550–560, 5 refs. Paris, 1935.

This report comprises four papers. In the first, by T. H. D. Griffitts, it is pointed out that since it has been proved that *Aëdes aegypti*, L., may

be carried by aeroplane for long distances [*cf.* *R.A.E.*, B **20** 51; **21** 183, etc.], the necessity for adopting measures to destroy insects in aircraft is obvious. In the case of an actual or potential outbreak of yellow fever, it is recommended that aeroplanes be fumigated with hydrocyanic acid gas in the form of Zyklon or Discoids [*cf.* **19** 261] at the rate of ½ oz. HCN [*sic* ? 14 oz.] per 1,000 cu. ft. (14 gm. per cu. m.), although higher doses may be desirable if cockroaches, flies, etc., are also to be destroyed. An exposure of half an hour kills mosquitos, and an hour's airing removes all traces of the gas; care should be taken that no water is left on board during fumigation. The most satisfactory spray is one containing a good extract of pyrethrum, generally dissolved in a kerosene. Commercial brands may contain substances added to render the odour agreeable; such substances frequently tend to make passengers more susceptible to air-sickness, and preparations for use in aircraft, particularly if they are applied during the voyage, should be as odourless as possible. As mosquitos are frequently found in the unoccupied part of the fusilage, this section should be separated from the others by means of metal screening.

In the second paper, by C. Michel, it is stated that the destruction of insects in aircraft is necessary not only from the point of view of hygiene but also because it has been found that cockroaches frequently infest the wings of the machine, where they feed on the glue and dope used in construction. The region of the United States along the Gulf of Mexico and the southern part of the Atlantic sea board is only two days' flight from the endemic foci of yellow fever in South America. Tests indicated that the most satisfactory spray for use in aeroplanes was one containing 4 per cent. "Pyrocide 40" in water-white kerosene. "Pyrocide 40" is an ethylene dichloride extract of flowers of pyrethrum dissolved at the rate of 4·3 gm. pyrethrin in 100 cc. mineral oil of the kerosene type. Experiments showed that 200 cc. of this spray killed the mosquitos in a cabin of 3,000 cu. ft. capacity in 15 minutes. It may be employed when passengers are present, it does not damage colours or materials and its smell disappears very quickly. The fact that the smell in a closed aeroplane tended to increase susceptibility to air-sickness led to the decision by one air line that spraying should not be carried out during the voyage but on arrival in the United States from South America, and at all foreign ports of call where the aeroplane remains for several hours. As a result of this measure, no mosquitos have been found during the last six months at Miami, Florida, where aeroplanes are systematically searched on arrival.

The mixture described was not satisfactory for destroying insects, other than mosquitos, that hide in the wings and obscure corners of the machine, so that fumigation with HCN is carried out every three months before the periodic overhaul to which the machines are subjected. The aeroplane is removed to an isolated spot, materials and floor boards are removed to allow the gas to penetrate all parts, the doors, portholes and hatchways are sealed with a special adhesive tape and Zyklon discoids (HCN with 5 per cent. chloropicrin as a warning gas) are distributed at the rate of 8 oz. HCN per 1,000 cu. ft. (8 gm. per cu. m.). The time of exposure is 6 hours. An electric fan is placed in the cabin to disperse the gas, which tends to remain in the tail of the machine. Experiments with Carboxide (1 part ethylene oxide to 9 parts carbon dioxide) showed that at the rate of 2 lb. per 1,000 cu. ft. (32 gm. per cu. m.), with an exposure of six hours at a temperature of 75°F., it killed rats, cockroaches and mosquitos. It was, however,

rather less effective than HCN, was slightly toxic to man, and the cylinders and apparatus were difficult to handle, so that under ordinary conditions it is not practical as a fumigant for aeroplanes.

The third paper deals with experiments to determine the minimum lethal dose of Carboxide when used against *Aëdes aegypti*. This could be expressed by the formula CE=6 in which C is the concentration of the gas in pounds per 1,000 cu. ft. and E the time of exposure in hours [*cf.* A **23** 121]. Thus 6 lb. Carboxide gave approximately the same results in one hour as 12 lb. in half an hour.

The fourth paper gives briefly the measures that are to be taken in the United States quarantine stations for spraying and fumigating vessels that arrive from maritime ports where yellow fever is present or suspected.

Wu (C. Y.). **Enquête sur les rats et leurs puces dans les ports de Chine.**—*Rep. Quarant. Serv. China* Ser. 4 p. 17. Shanghai, 1933. (Abstr. in *Bull. Off. int. Hyg. publ.* **27** no. 3 p. 570. Paris, March 1935.)

In 1933, investigations were made on the rats and fleas of Shanghai, Canton, Tangku, Hankow and Amoy. In the last three, *Mus* (*Rattus*) *norvegicus* was the most numerous rat and *Xenopsylla cheopis*, Roths., was present throughout the year and particularly numerous in summer. In Shanghai, where *M.* (*R.*) *rattus* was predominant, *X. cheopis* was found only from August to October, *Leptopsylla segnis*, Schönh. (*musculi*, Dug.) and *Ceratophyllus anisus*, Roths., were prevalent during the cool season but rare or absent during the warm weather, *C. fasciatus*, Bosc, was scarce, and *Ctenocephalides canis*, Curt., *C. felis*, Bch., and *Pulex irritans*, L., were very seldom found. The *cheopis* index in Shanghai was always under 1 (0·75 in August), in Amoy 2 or more, in Canton under 1 only in January, August and November, 7·5 in May, and 10 in June, in Tangku under 1 only in February and 11·7 in September, and in Hankow above 1 from June to November. There appears to be little danger of plague occurring in Shanghai, since *X. cheopis* is most prevalent there at a time when the incidence of plague in neighbouring endemic regions (Hongkong, Fukien) is at its lowest [*cf. R.A.E.*, B **18** 25]. Murine and human plague are rare in Amoy and in Canton since the construction of modern, hygienic, rat-proof dwellings. In parts of the interior of China, such as Shensi and Shansi, and in southern Manchuria, plague epidemics are still severe.

Eskey (C. R.). **Epidemiological Study of Plague in the Hawaiian Islands.**—*Publ. Hlth Bull.* no. 213, 70 pp., 6 figs., 4 refs. Washington, D.C., October 1934. (Abstr. in *Publ. Hlth Rep.* **50** no. 8 pp. 255–257, 1 ref. Washington, D.C., 1935.)

A rat-flea survey was carried out from April 1932 to March 1933 in two rural and two urban areas in the Hawaiian Islands, to determine why two different types of plague infection have occurred since the introduction of the disease in 1899. The plague epidemics in the urban areas spread rapidly from port to port but terminated after 12 years, whereas in the rural areas the infection is endemic at the present time and has shown little tendency to spread. A total of 59,062 fleas of 7 species were taken from 19,755 rats. *Xenopsylla cheopis*, Roths., which was the most widely distributed flea, was present in all localities

where plague had occurred and in the urban areas was the only rat-flea found in sufficient numbers to account for the transmission of the disease among rodents. In all localities it was found in greatest numbers on rats trapped within the shelter of buildings. High temperature and excessive dampness seem to have reduced the infestation of rats trapped outside buildings but to have had little effect on that of rats inside. It was concluded that the chief breeding places of this flea were within buildings and that rodents derived infestation by it chiefly from their contact with buildings. *Xenopsylla hawaiiensis*, Jordan [*cf. R.A.E.*, B **21** 48] was discovered during the survey, chiefly on the field rat, *Mus* (*Rattus*) *hawaiiensis*, but also on *M.* (*R.*) *norvegicus*. It was only found in small numbers on *M.* (*R.*) *rattus* or its subspecies, on rats trapped in buildings, or, in the two urban areas, on field rats ; but in the rural areas it was sufficiently abundant on the latter to account for the continuous transmission of plague among animals in the field. The degree of infestation was low in localities where the monthly precipitation was high and in those that were very dry through lack of rain. The comparatively light infestation of rats caught in buildings and the fact that larvae of this flea could not be reared in the laboratory until green grass was provided for food indicate that its breeding places are out of doors. *Ceratophyllus* (*Nosopsyllus*) *fasciatus*, Bosc, and *Leptopsylla segnis*, Schönh. (*musculi*, Dug.) were taken in considerable numbers on rats at altitudes of over 2,500 and 1,000 ft. respectively. They were not found in the seaports of the urban areas, and there is no evidence to connect them with the transmission of plague in the Islands. *Echidnophaga gallinacea*, Westw., was frequently observed on rats in enormous numbers, particularly in the relatively dry localities. *Ctenocephalides felis*, Bch., was present on rats in all four areas. Although *Pulex irritans*, L., appears to be present throughout a large part of the Islands, only 7 examples were seen on rats. In regions where endemic plague exists *M. hawaiiensis* comprised 25 per cent. or more of the rats trapped.

Experiments in the laboratory revealed very similar biological characteristics in *X. hawaiiensis* and *X. cheopis*. Measures for the eradication of plague from the two rural regions are discussed. Rat-proofing of buildings and trapping would be of little value, but poison baits of various kinds have given good results.

Rodhain (J.) & Brutsaert (P.). **L'évolution des** *Trypanosoma lewisi* **et** *Trypanosoma cruzi* **chez** *Melophagus ovinus.*—*C. R. Soc. Biol.* **118** no. 12 pp. 1228–1231, 2 refs. Paris, 1935.

The experiments described show that *Trypanosoma lewisi* and *T. cruzi* can develop in *Melophagus ovinus*, L., the infective metacyclic forms appearing in the posterior part of the intestine.

Lawrence (D. A.). **Report of the Director of Veterinary Research (Southern Rhodesia) for the Year 1934.**—Fol. 10 pp. Salisbury, 1935.

An undiagnosed disease of cattle causing a high annual mortality occurs on certain apparently well-defined areas on a ranch in Southern Rhodesia. Its effects are usually noticeable from the beginning of the rainy season until the first frosts. The first cases are observed 3 weeks after susceptible animals are transferred to grazing areas where the

disease is known to be present. The symptoms and *post-mortem* lesions are described. All attempts to transmit the disease by inoculation failed. The cattle in the affected areas were heavily infested with ticks, and experiments, of which no details are given, suggest that they play an important part in the transmission of the disease. *Rhipicephalus appendiculatus*, Neum., *R. evertsi*, Neum., and *Hyalomma aegyptium*, L., were the commonest ticks on cattle, although *Amblyomma hebraeum*, Koch, and *Boophilus annulatus decoloratus*, Koch, were also present. Mortality continued at a high level in stock left in infected areas ; but it ceased within a short time among cattle transferred to uninfected grazing grounds, and none of the susceptible cattle herded with them contracted the disease, even though dipping had been suspended for a time both before and after the cattle were moved so that tick infestation was marked.

SCHEDL (K. E.). **Untersuchungen zur Frage der Bettwanzenbekämpfung.** [Investigations on the Question of Bed-bug Control.]—*Anz. Schädlingsk.* **11** no. 3 pp. 25–27. Berlin, March 1935.

Experiments in Germany showed that Xylamon hell [a chlorinated hydrocarbon, *cf. R.A.E.*, A **21** 323, etc.] and Incidin II (another preparation of Xylamon) were effective against *Cimex lectularius*, L. Practical work in an infested house, which was left shut up for 24 hours after all the likely places had been sprayed with a mist spray of Xylamon hell, was completely successful. After some weeks a few bugs appeared, but these were traced to swallows' nest under the eaves, and since these were treated no bugs have been found.

BROWNLEE (A.). **A Species of *Demodex* found in Sheep in Britain.**—*J. comp. Path.* **48** pt. 1 pp. 68–73, 1 fig., 3 refs. Croydon, March 1935.

A species of *Demodex*, of which the measurements are given, is a fairly common parasite of sheep in Britain. It is found most frequently in the sebaceous glands of the skin in the region of the vulva and the prepuce. It is apparently more common in debilitated and emaciated sheep but it does not seem to have any pathological significance.

BROWN (E. W.). **The Efficiency of Carboxide Gas as an Insecticidal Fumigant for Naval and Merchant Vessels.**—*U.S. nav. med. Bull.* **32** no. 3 pp. 294–317, 1 pl., 6 graphs, 2 refs. Washington, D.C., July 1934. [Recd. May 1935.]

In continuation of work with Carboxide as a fumigant for the destruction of bed-bugs [*Cimex*] and cockroaches on board ship [*cf. R.A.E.*, B **22** 33], experiments were carried out in artificially and naturally infested ships to determine the amount required in spaces where leakage must be taken into consideration. Details are given of the methods used to make the spaces to be fumigated as airtight as possible. A special form of sealing tape that adheres to wooden or metal surfaces, whether painted or not, and leaves no residue was employed. In all cases the time of exposure was 3 hours, during which circulation of the air was maintained. In the cases of artificial infestation, which included 28 tests with bed-bugs in 19 of which parallel observations were made on cockroaches, the insects in small boxes

were placed in situations that required varying degrees of penetration in the gas. The initial concentration that resulted in ultimate kill of all the insects varied from 5·7 to 10 lb. per 1,000 cu. ft. according to the type of space to be fumigated and the degree of penetration required. In the naturally infested ships four tests were carried out on cockroaches in only one of which were bed-bugs also present. Concentrations ranging from 5·2 to 8 lb. all proved effective. In all experiments the spaces were free from any objectionable residue of gas within 10–15 minutes after opening doors, ports and ventilators. Although no gas masks were used and no special measures were taken to air contents beyond ordinary ventilation, no ill effects were observed among the personnel. It is concluded that an initial concentration of 6 lb. per 1,000 cu. ft. with an exposure of 3 hours would be adequate for fumigating vessels provided that due precautions were taken to facilitate penetration of the gas. In the case of the natural infestations, an initial irritating effect of the gas was observed that made both types of insects leave their sheltering places and come into the open. In the majority of the tests, none of the insects, either bed-bugs or cockroaches, succumbed during the period of exposure to the gas, but incipient weakness was commonly observed. Although Carboxide is more expensive than hydrocyanic acid gas, it can be applied without danger by the ships' personnel, thus obviating the loss of time and interference with operating routine that results from turning the vessel over to specialists.

Ross (I. C.). **Tick Paralysis : A fatal Disease of Dogs and other Animals in eastern Australia.**—*J. Coun. sci. industr. Res. Aust.* **8** no. 1 pp. 8–13. Melbourne, February 1935.

Much of the information contained in this paper on tick paralysis in Australia has already been noticed [*R.A.E.*, B **13** 28 ; **15** 32]. The limited distribution of the disease appears to depend on the susceptibility of *Ixodes holocyclus*, Neum., to slight variations in temperature and, particularly, in humidity. In the vicinity of Sydney the rainfall decreases rapidly with the distance from the coast and the incidence of the tick also declines. Moreover, bandicoots (*Parameles* spp.), which are its most important hosts and may be necessary for its survival, are abundant along the foreshores of Sydney harbour and in the northern suburbs. Although the majority of cases are caused by adult females, paralysis may also occur in dogs infested with large numbers of nymphs. Larvae are not known to cause paralysis, but give rise to intense local irritation. In order to determine whether the fact that paralysis does not occur before the fifth day of infestation is due to failure of the tick to produce a sufficient quantity of the toxin prior to this time, or whether it is due to some qualitative change that takes place in the secretion during the later stages of engorgement, experiments were undertaken with large numbers of ticks that had engorged for 3 or 4 days. It was found that by sufficiently increasing the numbers of glands injected, fatal results could be obtained with the salivary secretion of ticks of both ages. It would appear that paralysis may occur in very small animals in less than 4 days if the numbers of attached ticks are sufficient, but actually the numbers of ticks are usually small and there is little danger of this.

Ticks have been effectively controlled by using derris either as a powder rubbed well into the dog's coat or as an infusion made by

soaking 1 per cent. (by weight) of derris powder in cold water overnight and then adding sufficient soap to make a good lather before use. Newly attached ticks succumb in 4–8 hours, although semi-engorged ones may remain alive for 24 hours ; in practically every instance ticks becoming attached within 72 hours of application of the infusion, and in most cases within 96 hours, were also killed. As it takes 4 days for a small number of ticks to cause paralysis, treatment once a week should confer a high degree of protection, although the daily removal of ticks by hand should not be neglected. If reliance is placed on derris preparations only, care must be taken to remove ticks from the edges of the eyelids and the inner canthus of the eye, where there is no hair to retain the active principles for any length of time, and from the inside of the ear, which it is unwise to wet.

SEDDON (H. R.). **Blowfly Attack in Sheep : Its Prevention by Fold Removal (Mules' Operation).**—*J. Coun. sci. industr. Res. Aust.* **8** no. 1 pp. 25–26. Melbourne, February 1935.

An experiment in Australia confirmed the report that infestation of sheep by blowflies can be considerably reduced by the excision of the folds of the breech that are wetted by urine and so attract the flies.

RADFORD (C. D.). **Mites found upon the White Rat.**—*Northw. Nat.* **10** no. 1 p. 42, 5 refs. Arbroath, March 1935.

Myobia ensifera, Poppe, and *Notoedres muris*, Mégn., are recorded on brown and white rats, *Mus* (*Epimys*) *norvegicus*. The ears were distorted by crusty nodules containing eggs, larvae and adults of the latter mite. There was a marked preponderance of females. In a few instances the scabs were found on the face and the back and round the anus. *Echinolaelaps* (*Laelaps*) *echidninus*, Berl., has to date been taken in Manchester only from the brown rat.

ZUMPT (F.). **Zur Systematik der** *Glossina palpalis*-**Gruppe.** [The Classification of the *G. palpalis* Group.]—*Arch. Schiffs- u. Tropenhyg.* **39** no. 4 pp. 141–156, 10 figs. Leipzig, 1935.

The author regards Newstead's three groups of the genus *Glossina* [*R.A.E.*, B **12** 185] as subgenera under the names *Austenina* Towns. (type *brevipalpis*, Newst.), *Nemorhina* R.-D. (type *palpalis*, R.-D.), and *Glossina* s. str. (type *longipalpis*, Wied.). He gives keys to these subgenera and to the species of *Nemorhina*, with notes on the characters, distribution and synonymy of the latter. *G.* (*N.*) *martinii*, sp. n., which is closely allied to *G. palpalis*, is described from Tanganyika. *G. palpalis fuscipes*, Newst., is considered a distinct species to which all records of *G. palpalis* in eastern Africa refer, though both occur together in some parts of western Africa. The author also thinks that *wellmani*, Aust., and *maculata*, Newst., are merely aberrations of *G. palpalis*.

MALAMOS (B.). **Ueber Vorkommen von** *Schizotrypanum cruzi* **bei Affen in Niederländisch-Indien.** [The Occurrence of *Trypanosoma cruzi* in Monkeys in the Netherlands Indies.]—*Arch. Schiffs- u. Tropenhyg.* **39** no. 4 pp. 156–171, 16 figs., 23 refs. Leipzig, 1935.

Trypanosomes morphologically identical with *Trypanosoma* (*Schizotrypanum*) *cruzi* have been found in four young monkeys (*Macacus*

cynomolgus) received at Hamburg from Java. The infection was experimentally transmitted to other monkeys (*Macacus* and *Cercopithecus*), and to white mice and rats. *Triatoma infestans*, Klug, acquired the infection by sucking, and the flagellates in its excreta resembled the corresponding forms of *T. cruzi*.

It is therefore concluded that *T. cruzi* occurs in monkeys in the Netherlands Indies, and that the parasite found in them and called *T. vickersae* by Brumpt is identical with it.

BARANOV (N.). **K poznavanju golubačke mušice II.** [Contribution to the Knowledge of *Simulium reptans columbaczense*.] [*In Serbian*.]—*Vet. Arhiv* **5** pts. 2–3 pp. 58–96, 97–140, 6 figs., 1 graph, 1 map, 51 refs. Zagreb, 1935. (With a Summary in Russian.)

Following the serious outbreak of *Simulium reptans columbaczense*, Schönb., in north-eastern Jugoslavia in April–May 1934 [*R.A.E.*, B **22** 203], detailed investigations on its bionomics and control were continued in the infested area and in the laboratory in Zagreb.

The flies that attack man and animals in spring are fertilised females, but their eggs are still immature, and since the first females with developed ovaries were observed by the author on 6th May, he assumes that the preoviposition period lasts at least 2 weeks. The eggs are usually laid in water in one layer fixed to a substratum. Several batches, deposited by different females and containing a total of above a thousand eggs, are often joined together. Eggs are also laid on grasses near streams and hatch after the place has been flooded. In the laboratory, the egg stage lasted 2–3 days at room temperature. In the field, the larval stage lasted 21 days in May, and in the laboratory 20 days at 20–21°C. [68–69·8°F.]. There are apparently six instars. Before the beginning of the last moult the larva spins a cocoon, in which it pupates. In experiments the pupal period lasted 5 days. In the field all stages occurred simultaneously at the beginning of November.

The morphology of the Simuliid larva is described in detail, with particular reference to the mouth parts, and a key to the mature larvae of ten species is given.

In a discussion of the breeding places of *S. reptans columbaczense* evidence is adduced to prove that they are not exclusively confined to rapid mountain streams. Brief notes are given on the various places in Jugoslavia where the author has collected larvae, and sometimes pupae. In one instance, Simuliid larvae and pupae were present in numbers in a hot spring, in which the temperature of the water was about 30°C. [86°F.]. Thorough investigations of a mountain stream near Golubatz, supposed to be one of the chief breeding places of *S. reptans columbaczense*, proved that the species that breeds there profusely is the Chironomid, *Cardiocladius leoni*, Goetgh. [*cf.* **22** 204].

The technique of rearing Simuliids in the laboratory, in water through which air is kept bubbling, is described in detail. In small scale field experiments with various possible larvicides, larvae from an infested stream were taken to a neighbouring short stream and liberated at marked spots. When they had settled, the substance under test was introduced into the water and its effect observed at various intervals along the stream. Of 20 preparations, 5 (including a cresol-soap emulsion, Paris green, a tobacco extract and a pyrethrum preparation) proved effective.

It is now estimated that the total number of domestic animals killed by this Simuliid in 1934 was about 13,900, of which 11,400 were in Jugoslavia, 2,400 in Rumania, and nearly 100 in Bulgaria [*cf.* **22** 203]. The boundaries of the distribution of the fly in these countries is shown on a map.

Babić (I.) & Baranov (N.). **Beitrag zur Kenntnis der ektoparasitischen Fauna an Haustieren in Jugoslavien.** [Contribution to the Knowledge of the Ectoparasite Fauna of domestic Animals in Jugoslavia.] [*In Serbian.*]—*Vet. Arhiv* **5** pts. 3–4 pp. 141–144, 145–164, 37 refs. Zagreb, 1935. (With a Summary in German.)

Lists are given of parasitic Arthropods (including blood-sucking Diptera) collected on domestic animals in 12 districts of Jugoslavia from 1st June to 30th September 1934. They are arranged by localities and hosts, and in systematic order. Another list is confined to species (arranged by hosts) not mentioned in a preliminary paper [*R.A.E.*, B **23** 75].

Culicoides distigma, Kieff., which had previously been recorded only on donkeys in Morocco, was found in south-eastern Jugoslavia on buffaloes and cattle as well as donkeys.

Brumpt (E.). **La tularémie et ses hôtes vecteurs.**—*Med. Parasitol.* **4** no. 1–2 pp. 23–28. Moscow, 1935. (With a Summary in Russian.)

This is a brief review, based on the literature and personal observations over a period of thirty years, of the relation of a number of mammals, chiefly rodents, and birds and their ectoparasites to tularaemia. The animals are enumerated and divided into two groups; those that have been found naturally infected with *Bacterium* (*Pasteurella*) *tularense*, and those to which it has been experimentally transmitted. Notes are given on the various ticks and insects that transmit it or are able to harbour it for a considerable time. In spite of the number of animals that serve as reservoirs, cases of infection are comparatively rare in man, and those that occur are usually due to contact with animals caught for fur or food.

de Buck (A.) & Swellengrebel (N. H.). **On Seasonal Changes in *Anopheles maculipennis* in Holland with Reference to their Ability to act as malarial Vectors.**—*Med. Parasitol.* **4** no. 1–2 pp. 29–35, 2 graphs, 4 refs. Moscow, 1935. (With a Summary in Russian.)

An account is given of experiments in Amsterdam to ascertain whether the findings of James and others on the importance of the length of life of *Anopheles maculipennis*, Mg., in relation to the transmission of malaria by it [*R.A.E.*, B **14** 207; **18** 32, 227; etc.] are applicable to Holland, where as a rule infected individuals of the short-winged race are only found in September–December [**12** 174], a fact that has been attributed to gonotrophic dissociation [**18** 53]. Batches of mosquitos of this race were caught in stables near Amsterdam and fed on carriers of gametocytes of benign tertian [*Plasmodium vivax*]. Afterwards they were kept at 80°F. and 90 per cent. humidity until the sporozoites appeared in the salivary glands. This usually happened in 10–12 days. The infection was detected by dissecting a few mosquitos, after which the batch was transferred to an unheated room in

which the temperature varied from 37 to 75°F. Of 2,042 mosquitos dissected in the course of the year, 72 per cent. contained sporozoites. The percentages that survived until the glands were infected, and the percentages that survived for 4 weeks after the infecting meal (this figure being of the greatest practical importance) are shown in tables and graphs. The minimum rate of survival for 4 weeks occurred in April–August (15 per cent.) and the maximum in September–December (55 per cent.), with a period of transition in January–March (33 per cent. survival). The sporozoite rates were approximately equal throughout the year, showing the ability of the parasite to develop in the summer mosquitos. Similar results were obtained with laboratory-bred mosquitos, but the rate of survival was more uniform throughout the year and much higher than in the case of wild mosquitos. This confirmed James' view that mosquitos living in sheltered conditions are of special importance as malaria vectors. The author believes that the scarcity of summer infections in *A. maculipennis* is therefore to be explained, not only by the attraction exercised by stables [**18** 53], but also by adverse factors that shorten the life of the hibernating and summer generations.

HACKETT (L. W.). **Recent Findings bearing on the Epidemiology of Malaria in Europe.**—*Med. Parasitol.* **4** no. 1–2 pp. 39–44, 10 refs. Moscow, 1935. (With a Summary in Russian.)

The various theories to account for the occurrence of Anophelines in the absence of malaria in certain regions of Europe are briefly summarised, and the literature relating to the question of the races of *Anopheles maculipennis*, Mg., is reviewed [*R.A.E.*, B **22** 200, etc.]. The five races of this species are considered to be true subspecies on the ground of biological differences and the infertility of crosses between them, and the specific distinctness of *A. sacharovi*, Favr (*elutus*, Edw.) is regarded as uncertain. It is pointed out that the typical *maculipennis* and *melanoon*, Hackett, are virtually confined to stables in their search for food, whereas *labranchiae*, Flni., and *sacharovi* will take either human or animal blood as occasion offers and are associated with the most intense malaria; *messeae*, Flni., and *atroparvus*, van Thiel, are only rarely induced to enter dwellings, chiefly where there is a relative scarcity of domestic animals. Nevertheless, any subspecies may become a vector of malaria in certain circumstances, such as lack of animals, an influx of gametocyte carriers, or disproportionate Anopheline density.

[KANDELAKI (S. P.).] **Канделаки (С. П.). On the Relapsing Fever transmitted by Ticks in Transcaucasia.** [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 65–66, 4 refs. Moscow, 1935.

Cases of tick-borne relapsing fever seldom occur in Transcaucasia [*cf. R.A.E.*, B **17** 76] in spite of its proximity to Persia where a number of endemic centres of the disease exist. Recently a case has been recorded from Armenia, and the author observed two more, in which the infection was contracted in Azerbaijan, and its nature was demonstrated by the fact that all subinoculated laboratory animals developed spirochaetes. The vector in Transcaucasia, where *Ornithodorus papillipes*, Bir., has not been recorded, is unknown. *O. lahorensis*, Neum., was collected in various parts of the country,

including places in Armenia on the boundary of Persia, but failed to infect guineapigs or paretics after having fed on artificially infected animals. Furthermore, repeated transmission experiments with *O. moubata*, Murr., bred in the laboratory, gave negative results.

MARTINI (E.). **Kleinklima, Anophelesrasse und Malaria.** [Microclimate, Races of *Anopheles* and Malaria.]—*Med. Parasitol.* **4** no. 1–2 pp. 70–74. Moscow, 1935. (With a Summary in Russian.)

The part played by microclimatic conditions in the bionomics of insects is briefly reviewed with special reference to mosquitos [*cf. R.A.E.*, B **21** 136]. The zone where an Anopheline is found determines the conditions under which the development in it of the malaria parasite takes place, and since there is also an optimum zone for the parasite, this affects the distribution of the disease in any locality. The attractiveness of a given resting place to mosquitos may be approximately established by counts of females in various stages of physiological development. In the northern parts of the area in which malaria occurs, temperature conditions approach the minimum necessary for the extrinsic cycle of the malaria parasites, and even slight fluctuations in temperature may considerably affect it. This influence is particularly marked in the area of distribution of *Anopheles maculipennis*, Mg., and in the adjoining regions to the south. Since, however, there are different races of this species, the various racial preferences as regards temperature, humidity, food, etc., may partly account for the peculiarities of the epidemics of malaria in different districts.

[METELKIN (A. I.).] **Метелкин (А. И.). The Rôle of Flies in the Spread of Coccidiosis among Animals and Men.** [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 75–82, 9 refs. Moscow, 1935. (With a Summary in English.)

An account is given of laboratory investigations on the possibility of various flies disseminating Coccidia. The tests were made with *Musca domestica*, L., *Calliphora erythrocephala*, Mg., *Lucilia caesar*, L., *Cynomyia mortuorum*, L., *Stomoxys calcitrans*, L., and *Phormia terrae-novae*, R.-D. (*groenlandica*, Zett.). Measurements showed that the size of the proboscis of the first four species permits them to swallow the oöcysts of the Coccidia of rabbits (*Eimeria irresidua* and *E. exigua*) as well as of those occurring in other animals and man. Microscopic examination of the digestive tract of flies that had fed on infested faeces of rabbits revealed the presence of viable oöcysts in all the species used. They remained so long as there were faeces in the digestive tract, sometimes for as long as 24 hours. They did not undergo any changes and occurred in the specks of regurgitated matter or of faeces deposited by the flies on glass slides. The ejection of the oöcysts began 5–10 minutes after feeding and continued for 24 hours. As the specks dried up, the oöcysts were killed. Those kept for several days in a 2·5 per cent. solution of potassium dichromate at 25°C. [77°F.] developed normally. The flies of all species also carried oöcysts externally, especially on their legs, after having had access to infested faeces. The weight made contaminated flies less active and limited their flight. The oöcysts soon dried up.

Although Coccidia are rarely found in man, mechanical spread of coccidiosis by flies should not be overlooked during measures for preventing infection.

[PERFIL'EV (P. P.) & GUTZEVICH (A. V.).] **Перфильев (П. П.) и Гуцевич (А. В.). Materials on the Fauna of Sandflies** (*Phlebotomus*) **in Azerbaijan.** [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 95–98, 9 refs. Moscow, 1935.

In the course of the work of the malaria expedition to Azerbaijan during July–August 1931 [*R.A.E.*, B **23** 48], collections of sandflies were also made in houses and in the open in the Mugan Steppe in the south-east of the country. The species and numbers of the sandflies and the place of capture are tabulated. *Phlebotomus papatasii*, Scop., was easily predominant. The others in order of abundance were females believed by the authors to be those of *P. pirumowi*, Mirzayan [**23** 3], two males of which were also taken, *P. kandelakii*, Shchurenkova, *P. chinensis*, Newst., *P. caucasicus*, Marz., and *P. minutus* var. *arpaklensis*, Perfil'ev. All these species were taken in inhabited houses, but only *P. pirumowi* and *P. kandelakii* occurred in wild surroundings as well. They probably feed on wild animals and breed in their burrows.

[PETRISHCHEVA (P.).] **Петрищева (П.). Contribution to the Methods of studying** *Phlebotomus*. [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 99–104, 3 figs, 2 refs. Moscow, 1935.

Details are given of methods successfully employed in investigations on sandflies (*Phlebotomus*) in Central Asia during 1932–33. The best period for catching sandflies in the burrows of animals is from mid-April to the end of May. Those resting near the entrance hole may be caught by disturbing them with a long stick or a puff of smoke and then quickly placing over the hole a small cage made of fine metal netting, or a glass jar. Sandflies occurring further in the burrow may be driven out by a stream of smoke. Those near the entrance hole may also be collected from the walls of the burrow, or even when on the wing, by means of a small brush moistened with 70 per cent. alcohol.

At night, sandflies can be caught by directing a light on to a sheet of white paper smeared with a thin layer of castor oil; the inner side of the lampshade should be similarly coated with castor oil. An effective portable trap is made of a wooden box, with a roof sloping on two sides, below the centre of which a light is fixed. Horizontal slits, 2 ins. wide, are cut in the walls, and screens from them on the inside of the box are inclined towards each other so that the space between them gradually becomes narrower until it is only ½ in. wide. They are so arranged that the light shines out through the slits. A muslin sleeve is fixed to the box for removing the sandflies. The same type of box, but having walls made of fine metal gauze, may be used with live bait instead of a light, a small animal being placed in a cage inside.

In caves, sandflies are best caught with test-tubes or a brush soaked in alcohol as they alight on exposed parts of the body.

In the laboratory, the test tubes in which the adults are kept or the larvae reared should be placed in large glass jars with a layer of damp cotton-wool at the bottom. Ovipositing females live longer if some damp cotton or filter paper is placed at the bottom of the test tube. They may also be kept in tubes containing the medium for the larvae covered

with a round piece of filter paper. After oviposition the paper is turned face on the medium. To ensure rapid feeding, the tail or ear of the laboratory animal should be introduced into the test tube containing the sandfly. The best time for feeding is in the evening. The medium for rearing the larvae should be kept moderately damp, but pupation and the emergence of the adults take place on a completely dry medium. With a suitable medium, from 80 to 100 per cent. of the larvae survive. The best medium is the faeces of small animals or birds, which need not be sterilised.

[Popov (P. P.).] **Попов (П. П.). On Sandfly Fever, Species of** *Phlebotomus* **and dermal and visceral Leishmaniasis in Azerbaijan.** [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 107–111, 23 refs. Moscow, 1935.

In the course of investigations in 1931–34, it was found that sandfly fever occurs in various parts of Azerbaijan [*cf. R.A.E.*, B **18** 78], the towns of Gandzha and Barda in the centre of the country are endemic centres of dermal leishmaniasis, and cases of the visceral form of the disease (kala-azar), chiefly affecting native children, have been recorded from various districts, as well as leishmaniasis of dogs. Notes are given on the incidence of these diseases and on the local distribution of the species of *Phlebotomus* previously recorded from Azerbaijan [**14** 54; **18** 129] or collected during 1931–34. In addition to the species previously recorded, *P. major*, Ann., and *P. kandelakii*, Shchurenkova, were found. They occurred together with *P. papatasii*, Scop., *P. perniciosus*, Newst., and *P. sergenti*, Parrot, in the towns of Gandzha and Barda, but all five were also observed in localities free from dermal leishmaniasis.

Although the hamster, *Cricetulus migratorius pulcher*, is very common in Azerbaijan and is easily infected experimentally with visceral leishmaniasis, examinations of it for *Leishmania* gave negative results.

[Rukhadze (N. P.).] **Рухадзе (Н. П.). The Deviation of** *Anopheles maculipennis* **Meig. by domestic Animals and the Importance of this Phenomenon in the Prophylaxis of Malaria.** [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 121–125, 14 refs. Moscow, 1935.

This is a summary of observations carried out by the author and others since 1925 in Abkhazia (north-western Georgia) on the effect of domestic animals on the incidence of malaria [*R.A.E.*, B **14** 79; **15** 103; **17** 107]. The degree of protection afforded by animals varied greatly in different parts of the country according to the way they were stabled. In localities where they were better stabled, the malaria incidence was less. Other conditions being equal, the mosquitos (*Anopheles maculipennis*, Mg.) were chiefly diverted from human dwellings by cattle, but they were usually engorged with the blood of pigs, which are the best stabled animals in Abkhazia. They were also attracted by calves and sucking pigs.

Franchini (G.). **Sur les spirochétoses récurrentes dans l'Afrique italienne du nord.**—*Med. Parasitol.* **4** no. 1–2 pp. 140–141. Moscow, 1935. (With a Summary in Russian.)

Cases of relapsing fever have been recorded in Cyrenaica among Europeans, who are seldom infested with lice. Moreover, the clinical

aspect of the disease indicated that it was probably tick-borne. The species of *Ornithodorus* that have been found in Cyrenaica are *O. moubata*, Murr., *O. savignyi*, Aud., *O. lahorensis*, Neum., and *O. foleyi*, Parr. (*franchinii*, Rondelli). In Tripoli, cases of relapsing fever that have occurred from time to time among troops and natives have evidently been due to infestation by *Pediculus humanus*, L. (*vestimenti*, Nitzsch).

[Chaĭkin (V. I.) & Enikolopov (S. K.).] **Чайкин (В. И.) и Ениколопов (С. К.). A short epidemiological Description of Daghestan.** [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 142–147. Moscow, 1935.

In Daghestan, malaria is rife and epidemics are favoured by the presence of large accumulations of water in irrigated rice-fields, swamps formed by small rivers and mountain streams, reservoirs in orchards, and neglected wells, filter pools, etc. [*cf. R.A.E.*, B **20** 114]. The topography of 7 districts is discussed, with special reference to the breeding places of mosquitos and the prevalence of the disease. Of the Anophelines found in Daghestan [*cf.* **18** 254], *Anopheles maculipennis*, Mg., was the most common and widely distributed. The adult males occurred from about the middle of May until the end of October. The larvae were found in all types of breeding place, but were most numerous in rather shallow water with a pH of 6·8–8 and a carpet of vegetation at the bottom [*cf. loc. cit.*]. When larvicidal measures were carried out within a radius of 3 miles from some inhabited spot, the mosquitos bred in tubs and other receptacles for rainwater. *A. sacharovi*, Favr, which bred in places with dense tall vegetation rising above the surface of water, predominated in places where there was much subsoil fresh or mineral water. *A. hyrcanus*, Pall., came next in order of abundance, but *A. algeriensis*, Theo., was prevalent in some localities and, unlike the other mosquitos, sometimes occurred in shaded accumulations of water densely covered with reeds and having a peat bottom. *A. claviger*, Mg. (*bifurcatus*, auct.), *A. superpictus*, Grassi, and *A. plumbeus*, Steph., were rare.

The whole of the plain and the area at the foot of the mountains are severely infested with species of *Culex* and *Aëdes*, which cause great annoyance to man and animals. Tabanids and ticks are responsible for considerable losses to stock.

Pearson (A. M.). **An improved Method for the Determination of Cattle Fly Spray Repellence.**—*J. econ. Ent.* **28** no. 1 pp. 160–161, 6 refs. Geneva, N.Y., February 1935.

Studies of the repellence of sprays to cattle flies were carried out in Delaware in 1934, using a modification of the method of Pearson, Wilson and Richardson [*R.A.E.*, B **21** 110]. A brief review of the literature indicates that other workers have failed to allow for the great variation in the normal susceptibility of individual cows to flies.

After being washed on the preceding day, all test cows are sprayed with base oil alone at 6 a.m. daily for 4 days. From the results of hourly counts of flies made from 7 a.m. to 4 p.m. each day, the cows are placed in groups of 5 each on the basis of their individual susceptibility. During the following 4 days they are sprayed daily at 6 a.m. with a combination of the same base oil and the repellent under test, counts of flies being made as before. This method avoids the necessity

of allowing for the repellence of the base oil, as it is used throughout. An attempt to correlate individual susceptibility to flies with age, colour, size or period of lactation failed, and there appears to be no substitute for actual counts of flies in determining it. The base oil also tends to eliminate *Lyperosia* (*Haematobia*) *irritans*, L., which is much more easily repelled than the house-fly [*Musca domestica*, L.], or the stable fly [*Stomoxys calcitrans*, L.] and, owing to its sporadic occurrence, does not afford reliable data in spray tests.

Papers noticed by Title only.

Peters (H. S.). **A new Chicken Louse (Mallophaga : Philopteridae) from the Canal Zone** [*Lipeurus angularis*, sp. n., taken on fowls in association with *L. tropicalis*, Peters].—*Ohio J. Sci.* **35** no. 2 pp. 101–104, 3 figs., 2 refs. Columbus, Ohio, March 1935.

Liu (Chi-Ying). **Two new Bird Ceratophylli** [*Ceratophyllus swansoni* and *C. rileyi*] **from Minnesota (Insecta : Siphonaptera).**—*Ann. ent. Soc. Amer.* **28** no. 1 pp. 121–125, 6 figs. Columbus, Ohio, March 1935.

Fairchild (G. B.). **A new** *Tabanus* **(Diptera)** [*T. cayensis*] **from Florida.**—*Florida Ent.* **18** no. 4 pp. 53–54. Gainesville, Fla, March 1935.

Bogliolo (L.). **Prime ricerche ed osservazioni sui flebotomi della Sardegna.** *Phl. parroti* **var.** *sardous*, **var. n.** [First Researches and Observations on the Species of *Phlebotomus* in Sardinia. *P. parroti* var. *sardous*, n.]—*Ann. Igiene* **45** no. 1 pp. 41–47, 8 figs. Rome, January 1935. [Recd. April 1935.]

[Pavlovskiĭ (E. N.) & Steĭn (A. K.).] **Павловский (Е. Н.) и Штейн (А. К.). Experimental Investigations on the Effect of the Poison of** *Scolopendra* [*cingulata*, Latz.] **on the dermal Tissues of Man.** [*In Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 87–90, 22 refs. Moscow, 1935.

Parrot (L.). **Sur les phlébotomes du groupe** *minutus* **et sur la classification des phlébotomes en général.** [*In French and Russian.*]—*Med. Parasitol.* **4** no. 1–2 pp. 91–94, 9 refs. Moscow, 1935. [See *R.A.E.*, B **23** 43.]

Ancona (L.). **Contribucion al conocimiento de los piojos de los animales de Mexico.** *Columbicola columbae* **Linn.** [A Contribution to the Knowledge of the Lice infesting Animals in Mexico. *C. columbae*, L., on Pigeons.]—*An. Inst. Biol.* **5** no. 4 pp. 341–351, 12 figs., 8 refs. Mexico, D.F., 1934. [Recd. April 1935.]

Gaschen (H.). **Faune entomologique** [Anophelines, etc.] **des voies d'accès au Yunnan.**—*Bull. Soc. Path. exot.* **28** no. 3 pp. 194–198, 3 refs. Paris, 1935. [*Cf. R.A.E.*, B **23** 129.]

Whitehead (W. E.). **Records of Some Quebec Mallophaga and Anoplura**.—*Rep. Quebec Soc. Prot. Pl.* **25–26** pp. 84–87. Quebec, 1934. [Recd. April 1935.]

Kemper (H.). **Aus der neueren Literatur über gasförmige Mittel zur Raumentwesung.** [From the recent Literature on Fumigants for Disinfestation of Buildings (an annotated list of papers).]—*Z. GesundhTech. Städtehyg.* **27** no. 2–3 pp. 67–72. Berlin, 1935.

LEVER (R. J. A. W.). **Annual Report of the Government Entomologist for the Year 1932/33.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 4 pp. 2–5. Tulagi, October 1934. [Recd. March 1935.]

PAGDEN (H. T.). **Annual Report of the Senior Entomologist for the Year 1933/34.**—*T.c.* pp. 5–9.

Brief notes are given in both reports on *Lyperosia exigua*, de Meij., the importance of which on cattle in the Solomon Islands appears to have been overestimated. The Pteromalid parasite, *Spalangia cameroni*, Perk., was not recovered in Guadalcanal following liberation of a small consignment from Fiji in March 1933 [*R.A.E.*, B **22** 65]. Probably because of a too low temperature or partial dessication during transit, only six adults of *S. sundaica*, Graham, received from Australia, emerged.

RAYNAL (J.) & GASCHEN (H.). **Sur les Phlébotomes d'Indochine. VI. Présence de** *Phlebotomus sylvestris*, **Sinton 1924, en Nord-Annam et au Tonkin.**—*Bull. Soc. Path. exot.* **28** no. 3 pp. 219–229, 9 figs., 9 refs. Paris, 1935.

During October and November 1934, 15 females and 20 males of *Phlebotomus sylvestris*, Sinton, were collected in Tonkin and one female in northern Annam. This is the species recorded by Annandale and described by Sinton as *P. perturbans*, de Meij. [*cf. R.A.E.*, B **12** 112; **17** 30]. Both sexes are re-described, with the addition of the characters of the spermathecae in the female and those of the antennae, the palps and the bucco-pharyngeal armature in the male. The authors agree with Sinton in considering *Phlebotomus demeijerei*, Nitz. [**19** 57] a synonym of *P. sylvestris* [**19** 235].

MATHIS (M.). **Sur la nutrition sanguine et la fécondité de** *Stegomyia : Aëdes aegypti*.—*Bull. Soc. Path. exot.* **28** no. 3 pp. 231–234, 7 refs. Paris, 1935.

Under experimental conditions and at a temperature of 28°C. [82·4°F.], a few females of *Aëdes aegypti*, L., laid an average of 1,360 eggs in 22 batches after 22 blood meals over a period of 87 days.

MYERS (J. G.). **The Sand-fly Pest** (*Culicoides*).—*Trop. Agriculture* **12** no. 3 pp. 71–73, 4 refs. Trinidad, March 1934.

The species of *Culicoides* recorded from Trinidad are *C. furens*, Poey, and *C. trinidadensis*, Hoffman [*R.A.E.*, B **13** 129], and the latter was apparently responsible for the considerable annoyance experienced for several months of 1934 in the northern part of the Island. An account is given of the bionomics of Ceratopogonids of this genus and measures for their control, based mainly on investigations by the author on *C. furens* in the Bahamas [**21** 181].

KNIPLING (E. F.). *Gasterophilus inermis* **Brauer, a Species of Horse Bot not previously recorded from North America (Diptera : Oestridae).**—*Ent. News* **46** no. 4 pp. 105–107, 1 ref. Philadelphia, Pa, April 1935.

In May 1934, while examining at Illinois the rectum of a slaughtered horse, the author found two larvae of *Gastrophilus inermis*, Brauer, a

species that has not previously been recorded from North America. As it may have become established, the characters by which the larvae and adults may be distinguished from those of the species of *Gastrophilus* common in the United States are briefly described, with an outline of its life-history as given in a paper by Dinulescu [*R.A.E.*, B **20** 135].

Stefański (W.) & Obitz (K.). **Sur la fréquence et la distribution en Pologne de d'hypoderme du boeuf** (*Hypoderma* **sp.**). **Résultats d'une enquête du Ministère de l'Agriculture.** [*In Polish.*]—*Wiad. weteryn.* no. 176 pp. 89–97, 1 map. Warsaw, 1935. **Sur la distribution en Pologne de l'***Hypoderma lineatum* **de Villers.** [*In Polish.*]—*Op. cit.* pp. 98–105, 1 map. **Recherches sur les moyens de la lutte contre l'hypoderme du boeuf. Compte rendu pour l'annee 1934.** [*In Polish.*]—*Op. cit.* pp. 106–123. (With Summaries in French, pp. 97, 104 & 122.)

Obitz (K.). **Aperçu sur la biologie de l'hypoderme du boeuf.** [*In Polish.*]—*Op. cit.* pp. 126–130.

In the first paper the economic importance of infestation of cattle by warble-flies (*Hypoderma*) is briefly discussed, and a summary is given of reports on their distribution in various parts of Poland. In only 26 out of 225 districts was the rate of infestation less than 1 per cent., and in some of the others all the cattle were infested. The flies appear to be most abundant near forests or in mountain pastures. On the whole, the eastern part of Poland is more severely infested than the western.

The second paper deals with the results of investigations in 1934 on the occurrence in Poland of *Hypoderma lineatum*, Vill., as compared with *H. bovis*, DeG., based on examination of larvae taken from cattle between 25th March and 3rd August. Of over 3,000 larvae received from 202 districts only about 70 were *H. lineatum*. Most of the larvae of *H. lineatum* were taken early in the period of examination, indicating that they have abandoned their hosts before the end of May. The records showed that in Poland this species only occurs in a few districts along the frontiers, and it is believed that it has only recently been introduced.

The third paper summarises investigations on measures for control. Repellents are not considered practicable, chiefly in view of the protracted period of oviposition. Some protection may be afforded by sheds built in pastures in which the cattle could shelter from the attacks of the flies. Experiments in immunisation by injecting extracts of the larvae gave negative results. Squeezing the larvae from the warbles by hand is considered to be of great value; the authors object to the use of hooks, etc. [*cf.* **20** 177], by inexperienced operators, since they may cause injury to the animals. No instance of anaphylaxis was observed in the treated cattle [*cf.* **23** 37, etc.] A wash of powdered derris root and soft soap (applied at the rate of 4 gm. powder, 2 gm. soap and 40 gm. water per animal), and one made with a powder in which derris is incorporated with soap, both killed an average of 90 per cent. of the larvae [*cf.* **20** 48]. Since the young larvae are easier to kill, it is important to apply the treatment in the first half of April, before the animals are put out to pasture. It should be repeated at the end of May.

In the fourth paper a general account is given of the bionomics of *H. bovis* and *H. lineatum*. The adults, larvae and eggs are described, and the characters distinguishing the two species are pointed out. In Poland, the adults occur in pastures from June till autumn, and live for 8–10 days in warm weather or up to 25 if it is cool. The period spent by the larvae in the backs of the cattle averages 56 days for *H. lineatum* and 72 for *H. bovis*. The pupal stage of the former lasts 23–38 days and of the latter 37–56.

KNIPLING (E. F.). **The Larval Stages of *Hypoderma lineatum* de Villers and *Hypoderma bovis* DeGeer.**—*J. Parasit.* **21** no. 2 pp. 70–82, 27 refs. Baltimore, Md, April 1935.

The literature on the larvae of *Hypoderma*, which is reviewed, shows that workers are not agreed as to whether the number of larval instars is three, four or five. The author, who has studied a large number of larvae of *H. lineatum*, Vill., and a small number of those of *H. bovis*, DeG., gives reasons for considering that there are only three.

STOTCHIK (J.). **Report on Brine Treatment of *Hypoderma* Larvae in the Backs of Cattle.**—*J. Amer. vet. med. Ass.* **86** no. 4 pp. 488–492, 2 refs. Chicago, Ill., April 1935.

Common salt, either dry or in the form of a wash, has been used by stockmen as a treatment for infestation of cattle by *Hypoderma*. Experiments, however, in which a saturated solution of sodium chloride was applied as a wash on infested cattle or injected directly into the warbles, indicated that it is of no value against any of the stages of *Hypoderma* in the backs of cattle.

VECTEN (—) & COSSON (—). **Essai de traitement des plaies du cheval par les larves et les extraits de larves de *Lucilia sericata*.**—*Bull. Acad. vét. Fr.* **7** no. 8 pp. 352–357. Paris, October 1934.

A detailed account is given of the successful treatment of suppurating wounds on the leg of a horse with larvae of *Lucilia sericata*, L., and with extracts from them.

FROES (H. P.). **Observations on Brazilian "Blister Beetles."**—*J. Parasit.* **21** no. 2 p. 124. Baltimore, Md, April 1935.

Meloids of the genus *Epicauta* and Staphylinids of the genus *Paederus* are not uncommon in Brazil, the latter being generally considered the more annoying. A study of three lots of *Paederus* from three localities in Bahia has shown that the beetles are most abundant during the spring and early summer and annoy man chiefly when the air is humid after heavy rains. The blistering fluid is not emitted voluntarily, but exudes from any break in the integument when the insect is pressed or crushed, rubbing causing a linear lesion and crushing one in the form of a patch. The fluid is contained in all parts of the body, and lesions can be produced experimentally by the isolated head, thorax, abdomen or leg. Irritation and vesication may be produced in the absence of any abrasion of the skin.

Strong (R. P.), Sandground (J. H.), Bequaert (J. C.) & Muñoz Ochoa (M.). **Onchocerciasis with Special Reference to the Central American Form of the Disease.**—*Contr. Dep. trop. Med. Harvard Univ.* no. 6, xiv+234 pp., 8 (2 col.) pls., 100 figs., 2 maps, many refs. Cambridge [Mass.], 1934.

This comprehensive work on onchocercosis in man caused by *Onchocerca caecutiens* is divided into four parts: Onchocerciasis with Special Reference to the Central American form of the Disease, by R. P. Strong; On the Validity of the various Species of the Genus *Onchocerca* Diesing, by J. H. Sandground; Notes on the Black-Flies or Simuliidae, with Special Reference to those of the *Onchocerca* Region of Guatemala, by J. C. Bequaert; and Some Epidemiological Facts about the Onchocerciasis of Guatemala, by M. Muñoz Ochoa. The first part includes information on the distribution and epidemiology of the disease in Guatemala (the only country in which it occurs in America with the exception of Mexico), on its clinical manifestations and its vectors. A preliminary report has already been noticed [*R.A.E.*, B **20** 238].

Notes are given on the synonymy and distribution of the Simuliids recorded from Guatemala, with descriptions of the females and sometimes of the males, cocoons and pupae. They are *Simulium metallicum*, Bellardi (*avidum*, Hoffmann), *S. ochraceum*, Wlk., *S. callidum*, D. & K. (*Eusimulium mooseri*, Dampf), *S. exiguum*, Roubaud, *S. virgatum rubicundulum*, Knab (*S. v. chiapanense*, Hoffmann), and *S. mexicanum*, Bellardi (*aureopunctatum*, Malloch, *turgidum*, Hoffmann). The first four were observed biting man and developmental stages of *Onchocerca caecutiens* were found in the first three [*cf.* **20** 238], whereas the last two fed commonly on horses and were never seen to attack man.

Onchocercosis is confined to districts at an altitude of 2,500–5,000 ft., where the climate is temperate and a high grade of coffee is grown. In all of the endemic areas, *S. metallicum*, *S. callidum* and *S. ochraceum* are found; they were also abundant on a coffee plantation where the above conditions obtained but where no cases of the disease were observed. Although infected Simuliids are the only means of transmitting the disease from man to man in the endemic regions, it appears unlikely from their habits that they play an important part in spreading infection to distant places, and it is believed that infected man is responsible.

Much of the information on the early stages and adults of *Simulium* is taken from the literature. A description is given of a cage in which adults of *S. metallicum* and *S. callidum* and one female of *S. ochraceum* were reared from larvae and pupae found in small shallow mountain streams of clear, cool water running through coffee plantations above an altitude of 3,000 ft., the only situation in which these species are known to occur. From personal observations the flies are known to be abundant from February to June, and reliable reports make it seem probable that they are as prevalent, if not more so, during the coffee-picking season from September to February. The climatic conditions in July and August in the endemic areas do not suggest that any interruption in the breeding of the flies during these months is likely, and transmission of the disease probably takes place throughout the year. The adults are as abundant on ridges covered by forest as on the coffee plantations, and are as annoying in these situations as near the banks of the streams where they breed. They do not venture into the open unless travelling with people or animals. The females, which alone

bite, almost always attack man and animals out of doors during the daytime from about 6 a.m. to 6 p.m. They bite the exposed parts of the body but have never been observed to crawl beneath garments. In the course of dissections a Ciliate, several species of Protozoa and Nematodes other than *Onchocerca* were found in the flies. A fossorial wasp, *Oxybelus pyrurus*, Roh., was observed preying on the three probable vectors of *Onchocerca*.

BRIGHENTI (D.). **L'*Argas reflexus* Fab. come parassita dell'uomo.** [*A. reflexus* as a Parasite of Man.]—*Boll. Zool.* **6** no. 1–3 pp. 219–225, 23 refs. Turin, 1935.

Early in 1934 *Argas reflexus*, F., the usual hosts of which are pigeons, appeared in large numbers in the second floor of a house in Bologna, where a few had been seen about 2½ years before. Hundreds of adults and larvae were destroyed daily. They infested the furniture and invaded the beds, biting the occupants and causing one of them to experience considerable irritation and slight fever. They were found in great numbers in the attic of a house about 20 ft. away, where poultry and pigeons had once been kept. Even treatment with formol, petrol and kerosene failed to eradicate them. The literature on the subject of this tick attacking man is surveyed.

PEMBERTON (C. E.). **Entomology.**—*Rep. Comm. Exp. Sta. Hawaii. Sug. Pl. Ass. 1934* pp. 19–26. Honolulu, 1935.

Onthophagus incensus, Say, was introduced into Hawaii from Mexico in 1923. It was not observed subsequently until July 1934 when it was found to be common in Kona. This Coprid breeds in cow-dung in such large numbers that it dries it out rapidly through aeration and so checks the development of the larvae of hornflies [*Lyperosia irritans*, L.]. It should be particularly useful in dry localities.

NASH (T. A. M.). **The Identification of the three commonest Species of Nigerian Tsetse Fly.**—2 pp., 1 pl. Lagos, 1934. [Recd. May 1935.]

A brief popular key is given for the identification of living or freshly killed examples of *Glossina palpalis*, R.-D., *G. tachinoides*, Westw., and *G. morsitans*, Westw., for use in that part of Nigeria north of 9°N.Lat., where only these three species occur. For places further south the key is not accurate, but may still be used for differentiation between the first two.

WHITFIELD (F. G. S.) & WOOD (A. H.). **An Introduction to Comparative Zoology. A Textbook for Medical and Science Students.**—Crown 4to, x + 354 pp., 141 figs. London, J. & A. Churchill, Ltd., 1935. Price 15*s*.

This textbook treats the subject from a comparative and evolutionary standpoint and includes under the types described only examples that occur more or less universally. Four chapters are devoted to Arthropoda, the first two including an account of the classification, general structure and development of the Arachnida and Insecta and the third giving detailed descriptions of the cockroach and the locust. The fourth deals briefly with the more common insects of medical and veterinary importance.

Savory (T. H.). **The Arachnida.**—Crown 4to, xi + 218 pp., 8 pls., 99 figs. London, Edward Arnold & Co., 1935. Price 25*s*.

One of the objects of this work is to give to arachnology the unity and status of an individual science and to secure a balanced treatment of the Orders into which the Arachnida are divided. In the first part an account is given of the general characteristics, habits and behaviour, and of the evolution and classification of this Class of Arthropoda. The second part deals with the ten existing Orders, showing their morphology, distribution and classification, and with the fossil remains, the extinct Orders and a few groups of Arthropods that are doubtfully classified as Arachnids. The third section includes discussion of the economic status of Arachnids, which is determined almost entirely by mites and ticks, notes on the laboratory technique necessary in a study of this Class, an outline for a laboratory course in arachnology and an historical review of the literature. The appendix consists of a bibliography and indices to subjects, authors and species.

Preston (H.). **El Cube como parasiticida.**—*Bol. Direcc. Agric. Ganad. Peru* **4** no. 13–16 pp. 95–97. Lima, 1934. [Recd. May 1935.]

In experiments in Peru a suspension of the ground dried roots of cubé [*Lonchocarpus*] in a solution of sodium carbonate proved a successful dip in control of ticks and mange mites on sheep. The treatment protected sheep from re-infestation by ticks for at least a week. Ticks survived for several days on a piece of fleece wetted with the liquid and kept moist, but died in a day on another piece of fleece similarly wetted but allowed to dry. It is therefore concluded that the drying of the wool and the body warmth assist the action of the poison. The amount of sodium carbonate must be varied according to the hardness of the water.

Two applications, with a week's interval, of a mixture of 1 part cubé powder and 100 parts oil cured mange on llamas.

Joan (T.). **Acariosis del canario** (*Serinus serinus*, **L.**). [The Infestation of Canaries by Mites.]—*Bol. Minist. Agric. Argent.* **36** no. 3 pp. 229–234, 5 pls., 6 refs. Buenos Aires, 1934. [Recd. May 1935.]

Canaries (*Serinus serinus*) in Argentina are infested by four species of mites. Of these, *Proctophyllodes glandarinus*, Koch, occurs on the barbules of the feathers, *Analges passerinus*, L., on the barbules at the base of the feather and on the down, and *Picobia bipectinata*, Hell., in the interior of the base of the quill, whereas *Dermanyssus gallinae*, DeG., shelters by day in cracks, etc., of the cage and sucks blood by night. The first two feed chiefly on the fatty matter and scales of the feathers. They also suck blood, but are troublesome only if very abundant. *P. bipectinata* is more harmful, and continued infestation by *D. gallinae* causes death by exhaustion. Notes are given on the morphology and classification of all four species, together with the author's measurements of them.

The cages should be disinfested with boiling water every fortnight. Aviaries should be washed with boiling water, turpentine or oil. The feathers can be cleaned with alcohol, care being taken not to touch the skin; three applications at intervals of 8 days are required. Fallen feathers should be burnt to destroy mites inside the quills.

POOMAN (A.). **Erfahrungen mit einigen Milben.** [Experiments with some Mites.]—*Arch. Schiffs-u. Tropenhyg.* **39** no. 5 pp. 199–205, 4 figs., 7 refs. Leipzig, 1935.

In view of the fact that mites infesting foodstuffs are known to cause various allergic diseases in man [*cf. R.A.E.*, B **18** 22], the author conducted some experiments at Tartu, Latvia, with *Tyroglyphus siro*, L., *T. farinae*, DeG., and the predacious mite, *Cheyletus eruditus*, Schr. The differences between these three species are briefly noted. All three occurred in flour, and the first two in the rind of Dutch cheese. These mites, confined on the skin under a glass cover for about 8 hours, did not affect it in any way.

LANDAUER (E.). **Zyannatrium zur Bekämpfung von Fliegenlarven.**—*Arch. Schiffs- u. Tropenhyg.* **39** no. 5 pp. 218–219. Leipzig, 1935. **Sodium Cyanide in Fly Control.**—*Chinese med. J.* **49** no. 3 pp. 246–247. Peiping, March 1935.

The results of two years' extensive work on the control of flies breeding in human excreta in open trenches in China are summarised. It was shown that 0·15 per cent. sodium cyanide (in a 10 per cent. solution) by weight of night-soil killed almost all the larvae, but as the treatment would have to be repeated every 10 days, a campaign lasting from May to September would cost too much. In order to reduce the cost, experiments were made on the treatment of the surface alone. After laboratory experiments, many field trials were undertaken. A 0·8 per cent. solution applied to the surface of night-soil in open trenches at the rate of about 2½ pints per sq. ft. killed only 80 per cent. of the larvae, and would be too expensive.

SUGIMOTO (M.). **On a new Species of Mallophaga** (*Philopterus kozuii*) **parasitic on the Duck (Khaki-Cambell), and** *Lipeurus heterographus* **Nitz.** [*In Japanese.*]—*Taiwan no Chikusan* [Live Stock of Formosa] reprint 10 pp., 5 figs. Taihoku, Formosa, October 1934.

In central Formosa, this duck is severely injured by *Philopterus kozuii*, sp. n., the female of which is described. The lice occur round the eyes and kill over 5 per cent. of the young birds or 60 per cent. of those infested. The native ducks are also attacked, but are only slightly injured. A description is also given of *Lipeurus heterographus*, Nitzsch, with notes on the injury it causes; it has not been found in Formosa, but is likely to be introduced from Japan.

SUGIMOTO (M.). **Supplementary Report on the Head Mallophaga of Poultry.** [*In Japanese.*]—*Taiwan no Chikusan* [Live Stock of Formosa] reprint 9 pp., 5 figs. Taihoku, Formosa, December 1934.

Lipeurus denticlypeus, sp. n., collected on the neck and head of a hen, is described from Formosa. In the original the name *dentatus* was given, but it is corrected to *denticlypeus* in the reprint.

CARPANO (M.). **Sur un nouveau microparasite du type** *Grahamella-Rickettsia*, **observé chez les poulets** (*Grahamella gallinarum*).—*Ann. Parasit. hum. comp.* **13** no. 3 pp. 238–242, 1 pl. Paris, 1st May 1935.

The author describes *Grahamella gallinarum*, sp. n., and a bacterium from a fowl that died of disease in Egypt. As the bird was infested with *Argas persicus*, Oken, he suggests that this tick may be the vector of the *Grahamella*.

OMORI (N.). **On the Body Length and Weight of** *Cimex hemiptera* **Fab. and the Quantity of Blood it sucks.** [*In Japanese.*]—*Bot. & Zool.* **3** no. 3 pp. 589–593. Tokyo, March 1935.

Observations in Formosa showed that the eggs of *Cimex hemiptera*, F., are smaller if the females are old or under-fed, or if the temperatures are high or low. A nymph can complete any instar if it has a single blood meal. The weight of blood in mgm. sucked during one blood meal was 7·626 for the adult female and 4·99 for the male. A nymph sucked a total of 15·675 mgm. during its development at 27°C. [80·6°F.]. On an average, the adult females lived 118 days, laid 360 eggs, took 87 blood meals and ingested 152·52 mgm. of blood.

MIYAZAKI (I.). **On a Water Mite parasitic on a Species of** *Anopheles*. [*In Japanese.*]—*Bot. & Zool.* **3** no. 4 pp. 725–729, 1 col. pl. Tokyo, April 1935.

Notes are given on the bionomics of the water mite, *Arrhenurus madaraszi*, Daday, which was found parasitising the adults of *Anopheles* sp. in Kyushu.

JANISCH (E.). **Ueber die Vermehrung der Bettwanze** *Cimex lectularius* **in verschiedenen Temperaturen. (Beobachtungen bei der Aufzucht von Bettwanzen ii.)** [On the Increase of the Bed-bug *C. lectularius* in different Temperatures. (Observations during Experiments in breeding Bed-bugs. ii.)]—*Z. Parasitenk.* **7** no. 4 pp. 408–439, 18 figs., 10 refs. Berlin, 21st March 1935.

This second series of experiments on *Cimex lectularius*, L. [*cf. R.A.E.*, B **21** 213] deals with the reproduction rate at different temperatures and a relative humidity of 75 per cent.

The following main results are taken largely from the author's summary. At 27°C. [80·6°F.] and 32°C. [89·6°F.] no mortality was observed, whereas at 34°C. [93·2°F.] the whole stock died out in five generations. Data on the number of eggs laid by single females kept at different temperatures are given in detail and illustrated by curves. These data are considered to represent a very exact picture of reproductive ability under given conditions. When the conditions are near the optimum, most of the bugs exhibit practically the same reproductive ability, which approaches the maximum. Under conditions that are removed from the optimum but still do not cause larval mortality, a reduction in the total number and a great individual variation in the number of eggs laid are observed.

The senility of the parents results in a reduction in the rate of reproduction and an increase in the percentage of eggs that are not viable. When the conditions are unfavourable, these signs of senility

occur much earlier than under optimum conditions. The various phases of life and of reproduction (length of life and of the oviposition period, age when senility becomes apparent, length of the senile period, number and percentage of mortality of eggs, hatching of larvae) are not all influenced by unfavourable factors in the same way.

Although on the average young larvae bred under the same conditions are physiologically very similar, there are some significant physiological differences between the progeny of individual females. These differences are often only noticeable in the later stages, when abnormal mortality and reduced reproductive ability of the resulting adults can be observed. To obtain physiologically uniform stock for experiments, it is necessary to rear the parents under the optimum conditions. The individual females that are physiologically abnormal even under such conditions can be recognised at the beginning of the oviposition period by the number of eggs that are not viable, as well as by calculating the angle of the curve of rate of oviposition according to a method described.

OUDEMANS (A. C.). **Kritische Literaturübersicht zur Gattung *Pneumonyssus*. Beschreibung dreier Arten, darunter einer neuen.** [Critical Survey of the Literature on *Pneumonyssus*. Description of 3 Species including a new one.]—*Z. Parasitenk.* **7** no. 4 pp. 466–512, 60 figs., 27 refs. Berlin, 21st March 1935.

In this revision of the genus *Pneumonyssus*, the species recognised are *P. simicola*, Banks (*P. griffithi*, Newst., *P. foxi*, Weidwan, *Pneumotuber macaci*, Hoepke), *Pneumonyssus duttoni*, Newst. & Todd, *P. congoensis*, Ewing, and *P. stammeri*, Vitzth., all from the lungs of various monkeys, and *P. dinolti*, sp. n., described from the maxillary sinus of *Macacus* (*Pithecus*) *rhesus*.

ARNDT (W.). **Zwei Fälle im Beruf erlittener Schädigungen durch Formalin und durch Schmetterlingshaare.** [Two Cases of vocational Injury by Formalin and Hairs of Lepidoptera.]—*S. B. Ges. naturf. Fr. Berl.* 1934 pp. 289–294, 4 figs., 2 refs. Berlin, 1935.

An instance is recorded in which the hairs of Megalopygids and Limacodids, especially *Monema* spp., caused dermatitis of the arms, neck, face and chest and affected the eyes of a man engaged in preparing Lepidoptera in a museum.

DALLAS (E. D.). **Breve nota sobre dermatitis ocasionada por coleópteros del género *Paederus* (Staphylinidae) en la Rep. Argentina.** [A short Note on Dermatitis caused by Beetles of the Genus *Paederus* in the Argentine Republic.]—*Rev. chil. Hist. nat.* **38** pp. 168–169. Santiago, 1934. [Recd. May 1935.]

Records of cases of dermatitis caused by Staphylinids of the genus *Paederus* in South America are very briefly reviewed. The author has found that the species concerned in Argentina is *P. brasiliensis*, Er. No member of the genus has been recorded in Chile.

SÉGUY (E.). **Les insectes parasites des mammifères sauvages de la Forêt de Fontainebleau.**—*Trav. Nat. Loing* **7** pp. 80–135, 35 figs., 35 refs. Moret-sur-Loing, 1935.

Keys are given in this article to the orders, families, genera and species of the insect parasites of wild mammals in the Forest of Fontainebleau. Short biological notes are given on most of the species, and a list of the mammals with the insects that attack them.

SØMME (S.). **The Larva of *Plectrocnemia conspersa* Curtis (Trichopt. attacking Trout Alevins.**—*Norsk ent. Tidsskr.* **3** no. 6 p. 409). Oslo, 1935.

For some years very poor results have been obtained from stocking, certain lakes in southern Norway with trout. Larvae of *Plectrocnemia conspersa*, Curtis, were discovered near Kristianssand in May 1932, feeding on dead trout alevins, which had been introduced into the stream the previous day, and even holding some living fry. This is apparently the first record of Trichoptera attacking living fish [but *cf.* *R.A.E.*, B **22** 81] It seems that *P. conspersa* may have played some part in reducing the numbers of the trout, although other factors were probably also concerned, and really injurious attacks are likely to be rare.

[OLENEV (N. O.), ZASUKHIN (D. N.) & FENYUK (B. K.).] **Оленев (Н. О.), Засухин (Д. Н.) и Фенюк (Б. К.). A new Species of *Ornithodorus* in the South-East of U.S.S.R.** [*In Russian.*]—*Rev. Microbiol.* **13** no. 4 pp. 327–330, 5 figs., 2 refs. Saratov, 1934. (With Summary in English.) [Recd. May 1935.]

Nymphs and adults of *Ornithodorus verrucosus*, sp. n., the female of which is described in Russian and English, were found in June 1933 in the North Caucasus, 50 miles east of Stavropol, in a cave that had been inhabited by various animals. The ticks readily attacked man, and their bites caused acute pain.

[ZASUKHIN (D. N.), TIFLOV (V. E.) & SHUL'TZ (R. É.).] **Засухин (Д. Н.), Тифлов (В. Е.) и Шульц (Р. Э.). Endo- and Ecto-parasites of *Rhombomys opimus* Licht. Communication III.** [*In Russian.*]—*Rev. Microbiol.* **13** no. 4 pp. 335–338, 48 refs. Saratov, 1934. [Recd. May 1935.]

In this third contribution to the study of rodents connected with disease in the Russian Union [*cf.* *R.A.E.*, B **22** 193], a list is given of the endo- and ectoparasites of the jerboa, *Rhombomys opimus*, with indications of the frequency of their occurrence. They include 4 species of ticks and 29 of fleas.

[DEGTYAREV (M.).] **Дегтярев (М.). The Warble Fly and its Control.** [*In Russian.*]—44 pp., 35 figs. Novosibirsk, Sibirsk. Inst. Zashch. Rast., 1932. Price 45 *kop.* [Recd. May 1935.]

In view of the heavy losses caused annually in the Russian Union owing to infestation of cattle by warble flies, a popular account is

given of their bionomics, with notes on the morphology of the larvae and adults. Both *Hypoderma bovis*, DeG., and *H. lineatum*, Vill., are widely distributed in the country. The percentages of infestation in different areas is shown, and the effect on the cattle of the presence of the larvae in different parts of the body is discussed. Various methods of control are reviewed, and a list is given of the larvicides tested. All larvae were killed by injecting creolin (0·5 gm. per warble) or by two injections on successive days of 5 per cent. carbon tetrachloride. Excellent results were also obtained by applying to the warbles an ointment of 5–10 parts of pure phenol and 95–90 of some fat or vaseline, or of 1 part iodoform and 5 parts vaseline. Mechanical removal of the larvae should also be resorted to. Though injections of carbon bisulphide killed all the larvae, its application caused swellings, and its inflammable nature makes its use on a large scale dangerous. Repellents to prevent oviposition by the flies were ineffective, but a certain amount of protection may be afforded by keeping cattle stabled or in shaded places during the heat of the day or driving them into water.

A programme for the organisation of warble-fly control in the Russian Union is outlined.

Rossi (P.). **Sur la présence de** *Phlebotomus perniciosus* **à Mâcon.**—*Bull. Soc. Path. exot.* **28** no. 4 pp. 282–284, 1 ref. Paris, 1935.

The author records the presence of *Phlebotomus perniciosus*, Newst., the probable vector of canine leishmaniasis, at Mâcon in Burgundy. A case of infantile kala-azar has been reported in a child that had never left the Vosges, and the infection is believed to have been contracted from dogs belonging to a travelling circus. Recently the author saw a case of canine leishmaniasis in a dog brought to Mâcon from the south, and it is likely that dogs taken to the south would carry the infection back to Burgundy. There is thus the possibility of the extension of the region where human and canine visceral leishmaniasis occur through the agency of *P. perniciosus*, which is probably present throughout France.

Ekblom (T.). **Les races suédoises de l'***Anopheles maculipennis* **et leur rôle épidémiologique.**—*Bull. Soc. Path. exot.* **28** no. 4 pp. 284–289, 1 pl., 1 map, 6 refs. Paris, 1935.

In the course of the last two years the author studied the races of *Anopheles maculipennis*, Mg., that occur in various localities in Sweden [*cf. R.A.E.*, B **20** 70]. He discovered three races that he considers to be the typical form, var. *labranchiae*, Flni., and var. *messeae*, Flni. Most of the cases of malaria that occur in Sweden at the present time are imported, although from time to time rare cases of apparently local origin are observed. Formerly, however, the disease was common, and its distribution was recorded by Bergman in 1877. The author attempts to correlate the distribution of the races of *A. maculipennis* with the previous endemic and epidemic centres of the disease and the localities where recent cases have occurred, with a view to determining their relative importance as vectors. He concludes that var. *labranchiae* is absent from most of the regions where malaria was formerly present, that the typical form predominates in places where both endemic and epidemic malaria were prevalent, and that this form and var. *messeae* only are present in the region of Stockholm,

where the recent supposedly indigenous cases have been recorded. An examination of the characters of the egg-floats suggests that there are certain differences between the Swedish races and the corresponding forms in Holland.

In discussing the paper (p. 290) Roubaud suggests that the race designated as *labranchiae* may be var. *fallax*, Roub. [**23** 33].

Sergent (Et.). **Au sujet des variétés de l'***Anopheles maculipennis* **du groupe** *labranchiae.—Bull. Soc. Path. exot.* **28** no. 4 p. 290, 1 pl., 1 ref. Paris, 1935.

In the neighbourhood of Algiers 90 per cent. of the females of *Anopheles maculipennis*, Mg., lay eggs identical with those of var. *labranchiae*, Flni., but the eggs of the other 10 per cent. show characters intermediate between var. *labranchiae* and var. *sicaulti*, Roub. [*R.A.E.*, B **23** 146].

Treillard (M.). **Tableau synoptique pour la détermination rapide de toutes les espèces du sous-genre** *Stegomyia.—Bull. Soc. Path. exot.* **28** no. 4 pp. 291–292, 1 fldg chart, 2 refs. Paris, 1935.

The author gives a synoptic table, similar to that devised for the identification of the Anophelines of Indo-China [*cf. R.A.E.*, B **23** 35], by means of which it is possible to distinguish with the aid of a pocket lens living adults of the 41 species of the subgenus *Stegomyia* of *Aëdes*.

Estrade (F.). **Conditions climatériques et peste en Emyrne.**—*Bull. Soc. Path. exot.* **27** no. 4 pp. 401–403. Paris, 1934. **Observations relatives à la biologie de la** *Xenopsylla cheopis* **en Emyrne.**—*Op. cit.* **28** no. 4 pp. 293–298, 19 graphs, 3 refs. Paris, 1935.

The first paper deals with the relations between meteorological factors and the seasonal plague epidemics in the Province of Imerina, Madagascar. The theory that the outbreaks were due to the migration of rats from the rice-fields to dwellings at the time of flooding [*R.A.E.*, B **17** 203] is no longer tenable, since investigations have shown that cases of plague occur in many villages at the same time irrespective of their distance from rice-fields and that there are as many outbreaks in the hills as on the plains. Moreover, the rats can find sufficient food in the villages without migrating to the rice-fields in the first instance. The recrudescence of plague may rather be attributed to the increase in temperature in spring (July–August, the time when the rice-fields are flooded); it has been observed that fleas (*Pulex irritans*, L., or *Ctenocephalides*), which were in a state of torpor during the winter (April–June) and so seemed to have disappeared from houses, were reactivated in considerable numbers after a few days. A study of the effect of temperature on *Xenopsylla cheopis*, Roths., which has only recently been found in native huts [*cf.* **22** 156], showed that it hardly moves when the temperature is lower than 20–22°C. [68–71·6°F.], and that its activity, marked by more rapid and extended jumps, is greatest at 24–26°C. [75·2–78·8°F.], temperatures in the interiors of the huts that correspond to a maximum outside temperature of 26–28°C. [78·8–82·4°F.]. At about 40°C. [104°F.] it dies.

Plague reaches its annual peak at temperatures of 26–28°C., and if these are maintained on the plateau for several weeks, its

incidence becomes very high, as in 1925–26. If, on the other hand, the temperature rises still higher and reaches 30°C. [86°F.] as in 1929–30, the opposite result is produced. Only maximum temperatures are considered, as average and minimum ones do not appear to be connected with variations in the incidence of endemic plague. Owing to the extreme susceptibility of *X. cheopis* to variations in temperature, it seems probable that a temperature of 26°C. maintained for several hours a day is sufficient to reactivate both infected and infective fleas. In the course of investigations in a plague-infected locality, numbers of infected rats were found in houses, but so long as the exterior temperature did not rise above 26°C. no case of plague occurred in man. As soon, however, as the weather became warmer, plague again appeared, coincident with an increase in the activity of *X. cheopis*. There seems to be no relation between rainfall (as distinct from atmospheric humidity, which is constant in Imerina) and plague incidence.

The second paper deals with laboratory experiments on the effect of temperature and humidity on the longevity of *X. cheopis* living in débris under conditions as similar as possible to those in native dwellings. The fleas were not considered to be in a state of starvation, as they fed on the remains of cereals and perhaps on grains of starch in the vegetable débris, and were therefore probably more resistant than those used by Leeson [*cf.* **20** 181]. From the experiments it is concluded that it is possible for *X. cheopis* to survive for 2½ months or more apart from its host provided that it is among some sort of dust that contains cereal débris. The degree of humidity of the surrounding medium is of primary importance in determining the duration of life ; it must be almost constant or subject only to gradual variations. The optimum conditions at an altitude of about 4,000 ft. appeared to be a relative humidity of 85–95 per cent. and a temperature of 15–20°C. [59–68°F.]. With a relative humidity below 80 per cent. at 10–25°C. [50–77°F.], the fleas live only a short time, 7–8 days on the average. Sharp, repeated changes in the degree of humidity to below 70 per cent. at a constant temperature of 20°C., even when the periods of low humidity are short, rapidly bring about the death of all fleas. Susceptibility to variations in humidity increases with temperature. Thus fleas living apart from their hosts must have a habitat with little ventilation, so that the temperature may be constant. *X. cheopis* is almost always found in the corners of rooms, in the angles of staircases, in rice granaries, etc. ; in all these places there is hardly any ventilation and the temperature was found to be remarkably constant. It must also have a saturation deficiency that varies little, and the presence of vegetable débris in the dust in which it lives may serve to maintain a constant humidity. A humidity sufficient to induce the growth of moulds is also fatal. Under normal conditions in Imerina the temperature acts only on the degree of activity of *X. cheopis*. The enormous variations in humidity check the breeding of the flea during a period of the year and are thus also a factor in the seasonal character of the plague incidence, which is greatest in December and January and least in June and July.

HOUDEMER (E.). **Myiases des animaux domestiques en Indochine.**—*Bull. Soc. Path. exot.* **28** no. 4 pp. 298–300. Paris, 1935.

After briefly reviewing the cases of myiasis of domestic animals that he has observed in Indo-China, the author discusses myiasis of

the feet of horses, which is a form that is common and relatively serious. Unless the grooves in the centre and at the sides of the frog on the sole of a horse's foot are carefully cleaned, they retain fermentable material, particularly manure, which decomposes and produces an odour attractive to flies. The eggs are laid at the posterior ends of the grooves, and the larvae penetrate the living tissues beneath the horny layer, causing lesions that necessitate surgical treatment. Adults reared from larvae taken from these wounds proved to be *Chrysomyia bezziana*, Villen., which frequently infests man and animals and has already been recorded from man in Indo-China [*cf. R.A.E.*, B **18** 208, 276; etc.], and *Sarcophaga ruficornis*, F., which does not appear to have previously been recorded as causing myiasis there.

HOBBY (B. M.) & ELTON (C.). **Mortality in the Dung-fly,** *Scatophaga stercoraria* **Linn. (Dipt., Cordyluridae).**—*J. Soc. Brit. Ent.* **1** pt. 3 pp. 71–72. Southampton, 22nd April 1935.

During 1933 large numbers of adults of the dung-fly, *Scatophaga stercoraria*, L., were killed in various localities in Britain by the fungus, *Empusa muscae*.

RAMAKRISHNA IYER [AYYAR] (T. V.). **The Housefly Nuisance and its Control with Maggot Traps.**—*Madras agric. J.* **23** no. 3 pp. 96–98, 2 pls. Coimbatore, March 1935.

A brief account is given of the habits of the house-fly [*Musca domestica*, L.] in India. The four types of maggot traps that are described and illustrated are all based on the fact that the mature larva migrates from the moist medium in which it develops to seek a drier situation for pupation. Three consist of wire netting containers filled with moist manure and surrounded by or suspended over troughs of water into which the migrating maggots fall. The fourth has already been described [*R.A.E.*, B **3** 134]. The manure should never be allowed to become dry and should be renewed every 4 or 5 days.

PHILLIPS (J. S.). **The Biology and Distribution of Ants in Hawaiian Pineapple Fields.**—*Bull. Exp. Sta. Pineapple Prod. Ass. Univ. Hawaii* no. 15, iii + 57 pp., 4 figs., 61 refs. Honolulu, August 1934. [Recd. April 1935.]

To test the theory that the scarcity of house-flies [*Musca*] in Hawaii is due to the destruction of eggs and larvae by the ant, *Pheidole megacephala*, F., breeding material for flies was placed in two similar receptacles, from one of which ants were excluded. As the ants did not attack the pupae of either house-flies or blowflies, the results were calculated by counting the number of pupae after 10 days. On a comparison of the two boxes of breeding material, it was found that the ants had destroyed 60 per cent. of the blowflies and 99 per cent. of the house-flies.

LONG (J. D.) & MOSTAJO (B.). **Experiencias con pulgas como portadoras de peste bubónica.** [Experiences with Fleas as Vectors of Bubonic Plague.]—*Bol. Ofic. sanit. pan-amer.* **13** no. 11 pp. 1016–1024, 1 map. Washington, D.C., November 1934.

Since the first appearance of bubonic plague in Peru in 1903, 21,000 cases have occurred in 630 localities and an antiplague service has

been established [*R.A.E.*, B **21** 39]. Plague usually increases in spring and summer (October–March), the season during which fleas become numerous and are active. Nevertheless, sudden outbreaks of plague at times other than the plague season and in places that seemed to have no significant relation with infected areas have for some time been observed in Peru. These outbreaks occur in ports where cargoes of jute are discharged and in plantations that have received jute from these ports. The authors believe therefore that the sporadic outbreaks are due to infected fleas in cargoes of jute and sacking brought from India. In support of this view a record is given of the voyage of a steamer that left Calcutta in February 1933 with a cargo consisting mainly of bales of sacking and empty jute bags. Many of the bales had been put on board direct from trucks loaded at the factories. During the voyage the ship was fumigated at Durban in March, and 13 dead rats were found. No rats, but fairly fresh rat excreta, were seen during an inspection of 110 bales landed in April at the first port of call in Peru. Further bales were unloaded along the coast. Cases of plague subsequently occurred in places where the bales were opened but where plague had not been recorded for some years. There were no cases among the stevedores who unloaded the bales. The live fleas found when the bales were opened were *Xenopsylla cheopis*, Roths., *Hectopsylla* sp., *Leptopsylla segnis*, Schönh. (*musculi*, Dugès) and *Pulex irritans*, L. Old excreta of rats were also found inside the bales. Further, the interior of the bales was found to be very cool and damp, and the conditions of the voyage made it almost certain that after the ship left Durban the temperature inside them could not have risen to 15°C. [59°F.], which is said to be the lowest temperature at which fleas are active. They presumably became active when the bales were opened, and would remain infective for somewhat more than a fortnight.

WHITEHEAD (F. E.). **Damage to Livestock by Blood Sucking Midges.**—*Rep. Okla. agric. Exp. Sta. 1932–34* pp. 264–268. Stillwater, Okla. [1935.]

An account is given of an outbreak of *Culicoides varipennis*, Coq., that occurred near Shawnee, Oklahoma, in August 1934; the midges caused considerable injury to domestic animals. Their breeding place was discovered in the North Canadian river, which at that time was very low and sluggish. Sewage from Oklahoma City is dumped into this river, and at the point in question the water contained much organic matter on which the larvae fed. At the same time it was too polluted to allow the development of the normal river fauna, which includes their natural enemies. A short distance below the point where the sewage was introduced, the water was too foul for even the midge larvae to survive, and they were not found above it where the usual aquatic fauna was abundant. The extent of the infestation varied according to the prevailing wind and the topography, but in general occurred over a distance of about two miles from the river. Farmers were advised to place their stock in barns and to use smudge fires, and both measures brought a certain amount of relief from the pest. After the heavy rains that occurred in late August the river rose, the current became swift and the water muddy, and there was little evidence of sewage. Moreover, much oil from the Oklahoma City oil field was washed into the river, and for some

time the entire surface was covered with a film. The numbers of midges immediately began to decrease, and in a few days they were negligible.

Bradley (G. H.). **Notes on the Southern Buffalo Gnat,** ***Eusimulium pecuarum*** **(Riley) (Diptera : Simuliidae).**—*Proc. ent. Soc. Wash.* **37** no. 3 pp. 60–64, 5 figs., 4 refs. Washington, D.C., 1st May 1935.

Notes are given on the flight and oviposition of *Simulium* (*Eusimulium*) *pecuarum*, Riley, which caused the death of more than 500 mules in eastern Arkansas during April 1934. Though this Simuliid was reported to have caused enormous losses to livestock, particularly mules, in the Lower Mississippi Valley prior to 1887, little was heard of it from that time until 1927, when it killed about 100 farm animals in a locality in Mississippi. It killed considerable numbers of mules in another locality in Mississippi in 1928 and about 1,000 mules in that State and in eastern Arkansas in 1931 [*cf.* *R.A.E.*, B **20** 86; **22** 130]. Observations indicate that even in seasons when no appreciable loss of livestock occurs, the flies may be sufficiently numerous to cause a great deal of expense and inconvenience. Work animals must be greased or sprayed with repellents or even kept out of the fields during the busy period in spring, and cattle and other stock refuse to leave barns or the protection of smudge fires to graze, and they must therefore be fed. Animals subjected to attack lose flesh and are generally in poor condition. A description is given of the egg, and the male is re-described.

Gibbins (E. G.). **" Mbwa " Flies.**—*Uganda J.* **2** no. 4 pp. 272–277, 4 pls., 10 refs. Entebbe, 1935.

A general account is given of the habits of flies of the genus *Simulium*, of which some 30 species are known to occur in Uganda. In addition to *S. damnosum*, Theo. [*cf.* *R.A.E.*, B **22** 44], *S. neavei*, Roub., is probably a vector of onchocercosis [*Onchocerca volvulus*], as it is associated with the disease in the Belgian Congo [**21** 85] and possibly in Kenya [**10** 16]. *S. adersi*, Pom., bites man but is not apparently concerned in transmission [*cf.* **22** 44]. *S. ruwenzoriensis*, Gibbins, is not known to bite man, but causes annoyance by flying round the head, alighting on the face, and crawling into the eyes.

Jack (R. W.). **The Control of Tsetse Fly in Southern Rhodesia.**—*Rhod. agric. J.* **32** no. 4 pp. 237–261; also as *Bull. Minist. Agric.* [*S. Rhod.*] no. 950, 25 pp. Salisbury, S. Rhodesia, April 1935.

After giving brief notes on the bionomics of *Glossina*, particularly *G. morsitans*, Westw., the author outlines the history of the spread of this species in Southern Rhodesia and the measures taken to check its advance. He reviews other methods of control and gives his reasons for thinking that they are impracticable in Southern Rhodesia [*cf.* *R.A.E.*, B **21** 184].

Since 1914 cases of trypanosomiasis have occurred among cattle on farms along the border of Portuguese East Africa, due apparently to the incursions of occasional flies from that colony, where both *G.*

brevipalpis, Newst., and *G. pallidipes*, Aust., are known to occur [*cf.* **18** 217]. Only two examples, both *G. pallidipes*, have been taken within the borders of Southern Rhodesia, and it is apparently this species that is responsible for the losses sustained. As it is more shade-loving than *G. morsitans* and does not follow man for long distances, it was believed that a comparatively narrow clearing along the border would prevent its spread into Southern Rhodesia [*cf.* **21** 223]. During the last three years a clearing has been made for a distance of about 30 miles, and although it is as yet too early to ascertain its permanent effect, cattle are already being moved back in large numbers to evacuated farms.

HEGH (E.). **Les quatorze espèces de tsé-tsés du Congo belge.**—*Bull. agric. Congo belge* **25** no. 4 pp. 628–635, 5 refs. Brussels, December 1934. [Recd. May 1935.]

This is a summary of data on the appearance, bionomics and distribution in the Belgian Congo and elsewhere of the 14 species and 2 varieties of *Glossina* that occur in that country. They include, in addition to those already listed [*R.A.E.*, B **19** 104], *Glossina schwetzi*, Newst. & Evans [*cf.* **11** 198], with var. *disjuncta*, Potts [**12** 153], *G. pallicera*, Big., which is scarce and was found in forests and bush in the basins of the Upper Sankuru and Upper Lomami, *G. morsitans submorsitans*, Newst., the record of the occurrence of which (in the north-east of the country) appears to be doubtful, *G. longipalpis*, Wied., which is fairly abundant in the Province of Katanga and is able to adapt itself to types of the country that differ greatly in respect of shade and humidity, and *G. haningtoni*, Newst. & Evans, which is rare and was taken in Mayumbe.

BOURGUIGNON (G. C.) & JUSSIANT (A.). **Notes sur une épidémie de trypanosomiase porcine observée au Katanga.**—*Ann. Soc. belge Méd. trop.* **14** no. 4, pp. 393–399, 5 refs. Brussels, 31st December 1934.

An account is given of an outbreak of trypanosomiasis, due probably to *Trypanosoma simiae*, among pigs in a locality in Katanga where *Glossina morsitans*, Westw., is widespread and *G. brevipalpis*, Newst., is rare. Tabanids, particularly several species of *Haematopota*, were numerous, and species of *Stomoxys* were also present.

ZANETTI (V.). **La lutte contre les moustiques à Matadi en 1933.**—*Ann. Soc. belge Méd. trop.* **15** no. 1 pp. 127–154, 1 graph. Brussels, 31st March 1935.

After the outbreak of yellow fever at Matadi, Belgian Congo, in 1928, a campaign against mosquitos was organised. A graph shows the reduction in the number of mosquito breeding places that has taken place since that time. The anti-larval measures are described, and details are given of observations made in 1933 on the seasonal prevalence of the different species in completely or partly controlled and in uncontrolled zones. Ravines constitute the only natural breeding places, since the Congo at this point is unsuitable on account of its rapid current and perpendicular banks. *Anopheles gambiae*, Giles (*costalis*, Theo.) was the most abundant Anopheline. *A. rhodesiensis*, Theo., a species that has not previously been recorded from

this area, was found breeding in several places in the environs, but no adults were taken in the town. The incidence of malaria has been reduced.

ADAMS (A. R. D.). **Trypanosomiasis of Stock in Mauritius. I.** *Trypanosoma vivax*, **a Parasite of Local Stock.**—*Ann. trop. Med. Parasit.* **29** no. 1 pp. 1–18, 2 figs., 13 refs. Liverpool, 25th April 1935.

Although *Trypanosoma evansi*, the causal organism of surra in equines and bovines, has been known in Mauritius for many years [*R.A.E.*, B **17** 20], *T. vivax* has only recently been observed, and an account of its discovery in cattle bred locally is given in this paper. No species of *Glossina* or *Haematopota* has been recorded in Mauritius, *Hippobosca maculata*, Leach, is local and concentrated in its distribution, and *Tabanus ditaeniatus*, Macq., is rare and is found only on the open hills and never near stables, so that the probable vector of the trypanosome is *Stomoxys nigra*, Macq., which is ubiquitous and attacks all the larger mammals (including man) in large numbers [*cf. loc. cit.*].

EVANS (A. M.) & LEESON (H. S.). **The** *funestus* **Series of** *Anopheles* **in Southern Rhodesia, with Description of a new Variety.**—*Ann. trop. Med. Parasit.* **29** no. 1 pp. 33–47, 10 figs., 12 refs. Liverpool, 25th April 1935.

LEESON (H. S.). **Another Anopheline of the** *funestus* **Series from Southern Rhodesia.**—*T.c.* pp. 69–71, 6 refs.

In the first paper *Anopheles funestus* var. *leesoni*, Evans [*R.A.E.*, B **20** 68] is raised to specific rank and *A. funestus* var. *confusus*, n., is described from Southern Rhodesia. The characters distinguishing these forms and *A. funestus*, Giles, are given, together with records of their distribution in Southern Rhodesia. The adults of all three have been taken in houses, but the proportions are not known [*cf.* **22** 243]. Along the banks of streams, the adults may be found among grass and weeds, in crevices in the earth, and underneath piles of stones at river crossings. The larvae occur at the edges of slowly moving streams among the roots of grass and weeds, usually in clear water. They have been taken in swamps on the veldt, where there is an almost imperceptible movement of the water. In the wet season (November to April), adults can be found in all the usual situations, both indoors and out, and the larvae in most streams. In the dry months (June–September), larvae are obtained with great difficulty, and adults are scarce.

In the second paper, the larva, pupa and adults of both sexes of *A. funestus* var. *rivulorum*, n., are described from two localities in Southern Rhodesia. The habitats of the adults and larvae are similar to those described above.

SELLARDS (A. W.). **The Interpretation of the Incubation Period of the Virus of Yellow Fever in the Mosquito** (*Aëdes aegypti*).—*Ann. trop. Med. Parasit.* **29** no. 1 pp. 49–53, 10 refs. Liverpool, 25th April 1935.

The author discusses the interpretation given by Davis, Frobisher and Lloyd [*R.A.E.*, B **22** 71] of the results of their titration experiments on the virus of yellow fever in *Aëdes aegypti*, L. Their theory that

the extrinsic incubation period is required for the migration of the virus to the salivary glands makes it difficult to explain the apparent increase in the virus after the initial fall and the fact that a higher temperature greatly accelerates its dissemination. The present author considers that the incubation period is necessary for the multiplication of the virus. The initial loss may then be explained by the death of many of the organisms on ingestion by the invertebrate host, and the progressive prolongation of the period as the temperature is lowered, by the fact that the virus multiplies more readily at higher temperatures.

[Vasil'ev] Wassilieff (A.). **Expériences sur un nouveau produit arsenical larvicide.**—*Arch. Inst. Pasteur Tunis* **23** no. 4 pp. 449–454, 2 refs. Tunis, 1934. [Recd. May 1935.]

It is considered that Paris green, in order to be effective in the control of Anopheline larvae, should contain not less than 50 per cent. arsenic trioxide, and it is the high arsenic content that makes this product so costly. Russian authors have recently carried out successful experiments with a copper arsenite dust called Arsmal [*cf.* *R.A.E.*, B **22** 37, 194], which contains only 8·86 per cent. As_2O_3 and therefore costs much less. The author prepared a similar dust containing 10 per cent. As_2O_3 by dissolving 500 gm. copper sulphate in 500 cc. water, adding 198 gm. arsenic trioxide and bringing the whole to the boil. When the trioxide had dissolved, 1,282 gm. chalk ($CaCO_3$) was stirred in and the mass evaporated to dryness. The dust obtained ($CuHAsO_3$ adsorbed on chalk) passes easily through a silk sieve with 3,600 meshes to the square centimetre. In experiments in the laboratory on larvae of *Anopheles maculipennis*, Mg., this dust alone or mixed with 10 parts ash was compared with a mixture of 1 part Paris green with 10 parts ash, all the dusts being applied at the rate corresponding to about 0·9 lb. to the acre. All the larvae were dead in 2–2½ hours. The results show that the copper arsenite dusts were as toxic as Paris green, but that the pure dust acted more rapidly than when mixed with ash.

Nicolle (C.) & Giroud (P.). **Faits expérimentaux contraires à l'hypothèse de la transformation naturelle actuelle du virus typhique murin en virus historique, donc à l'unité actuelle de ces virus.**—*Arch. Inst. Pasteur Tunis* **24** no. 1 pp. 47–55. Tunis, 1935.

The author considers that if the virus of epidemic typhus can be derived at any time from the virus of murine typhus [*cf.* *R.A.E.*, B **21** 250; etc.], the latter should be easily adaptable to lice [*Pediculus*] and the former should be transmissible by fleas. Moreover, rats should become infected after feeding on lice infected with epidemic typhus since this is one of the most likely means of transmission. However, in the experiments described, no infections resulted when suspensions of lice fed on a monkey infected with murine virus were injected into guineapigs, when fleas fed on guineapigs infected with epidemic typhus fed on or were injected into guineapigs, or when rats ingested macerated lice infected by feeding on man.

Nicolle (C.) & Sparrow (H.). **Quelques expériences pratiquées avec le virus de la fièvre flèuviale du Japon (Tsutsugamushi).**—*Arch. Inst. Pasteur Tunis* **24** no. 2 pp. 179–217, 14 charts. Tunis, 1935.

Experiments undertaken in the course of laboratory investigations on the virus of tsutsugamushi disease showed that it can survive for at least 7 days in lice [*Pediculus*] and 11 days in fleas (*Xenopsylla cheopis*, Roths.), and that it can be transmitted by bites of the latter. Thus it is important that laboratory workers should avoid contact with the fleas of animals infected with tsutsugamushi disease.

Villain (G.), Dupoux (R.) & Marini (C.). **Contribution à l'étude de l'anophélisme tunisien et aperçu de la lutte antianophélienne dans la Régence.**—*Arch. Inst. Pasteur Tunis* **24** no. 2 pp. 309–342, 12 figs., 9 refs. Tunis, 1935.

A considerable amount of work has been done in Tunisia, particularly since 1932, on the determination of the species of Anophelines, their breeding places and measures for their control. A list is given showing the species found, the locality, the date of survey, and the type of breeding place. *Anopheles maculipennis*, Mg., which is by far the most abundant species, occurred in almost all localities. *A. hispaniola*, Theo., which is next in order of frequency, was found in the region of oases in the south, in the mountainous region along the Algerian frontier, and in certain other localities of limited extent. *A. multicolor*, Camb., which had previously been reported in the south and south west, was found in 1931 at Sahel far from the Sahara [*R.A.E.*, B **20** 195]. *A. algeriensis*, Theo., and *A. sergenti*, Theo., have been recorded from isolated localities only. The finding of *A. superpictus*, Grassi, at Sahel in 1932 was the first record in Tunisia and probably in North Africa.

One of the most important breeding places of mosquitos in Tunisia is constituted by wells, particularly those that have been abandoned or those from which the water is pumped by windmills, since in neither of these is the water stirred up as it is when buckets are used. Observations described indicate that the form of *A. maculipennis* in Tunisia prefers to feed on man, and examination of the eggs and larvae [see next paper] showed that they were all of the race *labranchiae*, Flni. The larvae were rare in December 1932 and had disappeared entirely at the beginning of January, whereas the adults were still numerous in houses, so that this species undergoes semi-hibernation, a fact that is of great importance in the epidemiology of malaria. Although larvae of *A. maculipennis* have been taken as early as 1st March, Anopheline larvae do not begin to occur generally until April. Larvae of *A. hispaniola* were found in association with those of *A. maculipennis* at the beginning of April 1933 in a locality considerably further north than that in which it has already been recorded early in the year [*cf.* below, p. 000].

A brief outline is given of the permanent malaria control works that have been undertaken in Tunisia during the last 5 years ; where these have been completed, there has been a marked diminution in the incidence of the disease. The temporary anti-mosquito measures, which are reviewed, include oiling, dusting with Paris green and the use of *Gambusia holbrooki*, this fish being particularly effective in oases.

Mathis (C.), Durieux (C.) & Advier (M.). **La vaccination antiamarile comporte-t-elle des dangers dans les régions où la fièvre jaune sévit endémiquement et où les *Stegomyia* abondent? (Première note.)**—*Bull. Acad. Méd.* **112** no. 35 pp. 535–538, 2 refs. Paris, 1934. [Recd. May 1935.]

The experiments described were undertaken to determine whether mosquitos [*Aëdes aegypti*, L.] that bit persons vaccinated with neurotropic yellow fever virus could transmit yellow fever to healthy individuals [*cf. R.A.E.*, B **21** 135, 141]. In the three tests from 5 to 10 mosquitos were fed on the patient each day from the 1st to the 8th day after vaccination and the survivors were fed twice on healthy monkeys (*Macacus rhesus*), firstly between the 13th and 15th day and secondly between the 20th and 28th day after feeding on man. No infection resulted.

Galliard (H.). **Contribution à l'étude des races d'*Anopheles maculipennis* en Tunisie.**—*Arch. Inst. Pasteur Tunis* **24** no. 2 pp. 343–351, 3 figs., 15 refs. Tunis, 1935.

From an examination of the eggs, larvae and adults of both sexes of *Anopheles maculipennis*, Mg., from various localities, the author concludes that var. *labranchiae*, Flni., is the predominant race in Tunisia.

[Vasil'ev] Wassilieff (A.). **Quelques remarques sur les moustiques de Tunisie.**—*Arch. Inst. Pasteur Tunis* **23** no. 3 pp. 368–383, 1 fldg map, 14 refs. Tunis, 1934. [Recd. May 1935.] **Etude de quelques gîtes d'anophèles tunisiens.**—*Op. cit.* **24** no. 2 pp. 352–359, 1 ref. Tunis, 1935.

In the first paper the author gives the distribution in Tunisia of *Anopheles maculipennis*, Mg., *A. algeriensis*, Theo., *A. hispaniola*, Theo., and *A. multicolor*, Camb., as observed by him during visits to various localities made from September 1933 to January 1934. During November–December investigations were made on the Anophelines of the region of Sahel de Sousse, one of the most malarious in Tunisia. No larvae were found, but adults were taken in houses, particularly in store rooms that contained supplies of food, raw wool, clothes, and often a stove with embers, which provided both warmth and odours to attract mosquitos. *A. maculipennis* was the prevalent species in houses where cases of malaria were found ; no males were taken, and most of the females were engorged. If Culicines were taken in houses, they were usually found in the living rooms on the walls, curtains and shutters. The temperature of the dwellings where mosquitos were taken ranged up to 11–13°C. [51·8–55·4°F.] or sometimes up to 16°C. [60·8°F.]. *A. maculipennis* was less prevalent in cow-sheds, stables, etc., probably because they were of primitive construction and therefore draughty. Dissection of 36 females revealed oöcysts in the stomach of one. In some of these females the ovaries were undeveloped, but in others they were well grown and the stomachs were empty of blood. The author discusses the hibernating habits of these mosquitos. Three larvae of *A. algeriensis* were taken in a well in a village, an unusual breeding place for a species that has previously been reported to leave houses as soon as it has fed and to prefer wooded localities on mountain slopes. Larvae of *A. hispaniola* have been found by the author at the beginning of April as well as in July [*cf. R.A.E.*, B **22** 19].

In the second paper the author describes examples of typical permanent breeding places of *Anopheles maculipennis* and *A. hispaniola*. Larvae of *A. maculipennis* were found in the middle of a stream among the matted leaves of aquatic plants, the numbers varying according to the species of plants forming the association. The most frequent and most favourable association was composed of *Ranunculus aquaticus tricophyllus*, *Nitella micronata*, *Potamogeton* spp., and *Ceratophyllum demersum*, with the addition in certain places of *Chara foetida* and *Smilax mauritanica*. Nearly all these plants have fine leaves, which together form a spongy mass. Larvae were rare or absent among the semi-aquatic plants along the banks. Larvae of *A. hispaniola* were found in large numbers among masses of floating aquatic plants with fine leaves consisting of *Arthrocnemon macrostachium*, *Ruppia rostellata*, and *Phucagrostis nodosa* in ditches of water with a salt content of 10·53 per mille, in which larvae of *A. multicolor* also occurred. The finding of larvae of *A. hispaniola* in all instars in November and December suggests that in Tunisia, as in Algeria, this is an autumnal species and that anti-larval measures should be carried out even in winter in localities where it is known to be present. The most important of these in the two breeding places discussed would appear to be the removal of the masses of floating aquatic vegetation into which oil does not seem to penetrate, followed by oiling.

SOESILO (R.). **Het** *hyrcanus* (*sinensis*)**-vraagstuk op Java. (Voorloopige mededeeling.)** [The *hyrcanus* (*sinensis*) Question in Java. (Preliminary Communication.)]—*Geneesk. Tijdschr. Ned.-Ind.* **75** no. 9 pp. 767–769, 5 refs. Batavia, April 1935.

Anopheles hyrcanus, Pall., has been shown to feed readily on man in both Java and Sumatra, and an epidemic of malaria due to it has been recorded in Sumatra [*R.A.E.*, B **10** 38]. In August 1934 it was the predominant Anopheline during an epidemic in Java. Of 386 females dissected 3 were infected, and no infection was found in the other species. In November 1934, when the varieties were examined separately, 7 infections were found in 334 females of *A. hyrcanus* var. *nigerrimus*, Giles, and 1 in 39 of *A. hyrcanus* var. *sinensis*, Wied., giving a combined infection index of 2·1 per cent. Again, none of the other species was infected, with the exception of 1 out of 7 of *A. aconitus*, Dön. This species was obtained only in very small numbers.

OLAVARRÍA (J.) & HILL (R. B.). **Algunos datos sobre las preferencias hemáticas de los** *A. maculipennis*. [Some Data on the Blood Preferences of *A. maculipennis*.]—*Med. Países cálidos* **8** no. 4 pp. 169–176, 11 refs. Madrid, April 1935. (With a Summary in English.)

A table shows the results of 2,527 precipitin tests of the blood in freshly engorged females of *Anopheles maculipennis* var. *atroparvus*, van Thiel, caught in houses and animal quarters in the malarious province of Cáceres, Spain [*cf. R.A.E.*, B **23** 129]. No other race of *A. maculipennis*, Mg., was found there. About 40 per cent. of the mosquitos from houses and 2 per cent. of those from animal quarters contained human blood. Three times as many mosquitos occurred in animal quarters as in houses.

Papers noticed by Title only.

Ferris (G. F.). **Mallophaga from Tahiti.**—*Bull. Bishop Mus.* **113** pp. 7–12, 4 figs., 1 ref. Honolulu, 1935.

Edwards (F. W.). **Tahitian Simuliidae** [including *Simulium oviceps*, sp. n.].—*Bull. Bishop Mus.* **113** pp. 35–38, 2 figs., 2 refs. Honolulu, 1935.

Stewart (M. A.). **Some Society Islands Siphonaptera.**—*Bull. Bishop Mus.* **113** p. 119, 1 ref. Honolulu, 1935.

Stewart (M. A.). **Marquesan Siphonaptera.**—*Bull. Bishop Mus.* **114** p. 210, 1 ref. Honolulu, 1935.

Edwards (F. W.). **Mycetophilidae, Culicidae and Chironomidae and additional Records of Simuliidae, from the Marquesas Islands.**—*Bull. Bishop Mus.* **114** pp. 85–92, 5 refs. Honolulu, 1935.

Enderlein (G.). **Neue Simuliiden, besonders aus Afrika.** [New Simuliids, chiefly from Africa.]—*S. B. Ges. naturf. Fr. Berl.* 1934 pp. 358–364. Berlin, 1935.

Fraga G. (A). **La sub-familia Tabaninae de los Tabanidae de Chile. Sistemática del género** *Tabanus* (*sensu lato*) **y de sus cuatro subgéneros.**—*Rev. chil. Hist. nat.* **38** pp. 180–187. Santiago, 1934. [Recd. May 1935.]

Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Genera of the Subfamily Calliphorinae based on a Comparative Study of the Male and Female Terminalia. The Genus** *Calliphora* **Robineau-Desvoidy (sens. lat.) : A Practical Guide to the Australian Species.**—*Ann. trop. Med. Parasit.* **29** no. 1 pp. 19–32, 10 figs., 2 refs. Liverpool, 25th April 1935. [Continued, *cf. R.A.E.*, B **22** 176.]

Patton (W. S.) & Wainwright (C. J.). **The British Species of the Subfamily Sarcophaginae, with Illustrations of the Male and Female Terminalia.** [Part I].—*Ann. trop. Med. parasit.* **29** no. 1 pp. 73–90, 12 figs. Liverpool, 25th April 1935.

De Meillon (B.) & Evans (A. M.). **Two new Anophelines from South Africa** [*Anopheles cameroni*, sp. n., and *A. walravensi* var. *milesi*, n., described from single Females from Cape Province and Southern Rhodesia respectively].—*Ann. trop. Med. Parasit.* **29** no. 1 pp. 91–94, 2 figs., 6 refs. Liverpool, 25th April 1935.

Ancona H. (L.). **Contribución al conocimiento de los piojos de los animales de México. II.** *Menopon gallinae* **Linn.** [A Contribution to the Knowledge of the Lice infesting Animals in Mexico. II. *M. gallinae*, L., on fowls.]—*An. Inst. Biol. Univ. Mex.* **6** no. 1 pp. 53–62, 11 figs., 4 refs. Mexico, D.F., 1935. (With a Summary in English.)

Ripstein (C.). **Los mosquitos del Valle de México. II.** *Theobaldia inornata* **Will.**—*An. Inst. Biol. Univ. Mex.* **6** no. 1 pp. 63–70, 7 figs., 4 refs. Mexico, D.F., 1935. (With a Summary in German.)

de Buck (A.) & Swellengrebel (N. H.). **On the Seasonal Longevity of** *Anopheles maculipennis* **in Holland with Reference to their Ability to act as Malarial Vectors.**—*Proc. Acad. Sci. Amst.* **38** no. 3 pp. 335–344, 4 diagr., 4 refs. Amsterdam, 1935. [*Cf. R.A.E.*, B **23** 162.]

Karamchandani (P. V.). **The Vertex and the Phallosome Leaflets of** *Anopheles maculipennis* **Meigen.**—*Rec. Malar. Surv. India* **5** no. 1 pp. 19–21, 1 pl., 3 refs. Calcutta, March 1935.

Peus (F.). *Theobaldia* (**Subg.** *Culicella*) *ochroptera* **sp. n., eine bisher unbekannte Stechmücke.** [*T. ochroptera*, sp. n., from Mark Brandenburg.]—*Märk. Tierw.* **1** no. 3 pp. 113–121, 4 figs., 3 refs. Berlin, 1st April 1935.

Wundrig (G.). **Ueber das Sammeln und Konservieren von Ektoparasiten.** [On Collecting and Preserving Ectoparasites.]—*Märk. Tierw.* **1** no. 3 pp. 126–128. Berlin, 1st April 1935.

Liu (Chi-ying). **Methods of Collecting, Preserving and Mounting Siphonaptera and Mallophaga.** [*In Chinese.*]—*Ent. & Phytopath.* **3** no. 11 pp. 220–225. Hangchow, 11th April 1935.

Iyengar (M. O. T.). **The Identification of the Common Rat-fleas of India** [with keys to the genera and species].—*Indian J. med. Res.* **22** no. 4 pp. 657–686, 5 pls., 11 figs. Calcutta, April 1935.

Horváth (G.). **Eine neue Fledermauswanze aus dem Spessart.** [A new Bat Bug, *Cimex stadleri*, sp. n., on *Vespertilio murinus*, from the Spessart, Bavaria.]—*Mitt. dtsch. ent. Ges.* **6** no. 1–2 pp. 13–14. Berlin, 1935.

Hefley (H. M.). **A new Mite** [*Laelaps stegemani* sp. n.] **from the Common Skunk :** *Mephitis nigra* [in New York State].—*J. Kansas ent. Soc.* **8** no. 1 pp. 22–24, 3 figs., 4 refs. McPherson, Kans., January 1935. [Recd. May 1935.]

Thor (S.). **Aenderung des Namens einer Unterfamilie der Trombidiidae W. E. Leach 1814.** [Alteration of the Name of a Subfamily of Trombidiidae.]—*Zool. Anz.* **110** no. 1–2, p. 47, 1 ref. Leipzig, 1st April 1935. [*Cf. R.A.E.*, B **23** 120.]

Münchberg (P.). **Ueber die bisher bei einigen Nematocerenfamilien (Culicidae, Chironomidae, Tipulidae) beobachteten ektoparasitären Hydracarinenlarven.** [On the known Larvae of Hydracharina ectoparasitic on some Families of Nematocera (Culicidae, Chironomidae, Tipulidae).]—*Z. Morph. Oekol. Tiere* **29** no. 5 pp. 720–749, 10 figs., 2 pp. refs. Berlin, 18th April 1935.

Ingram (W. W.) & Musgrave (A.). **Spider Bite (Arachnidism) : A Survey of its Occurrence in Australia, with Case Histories.**—*Med. J. Aust.* 20th Year **2** no. 1 pp. 10–15, 1 col. pl., 1 fig., 52 refs. Sydney, 1st July 1933. [Recd. May 1935.] [*Cf. R.A.E.*, B **22** 18.]

Marshall (J.). **The Location of olfactory Receptors in Insects : A Review of experimental Evidence.**—*Trans. R. ent. Soc. Lond.* **83** pt. 1 pp. 49–72, many refs. London, 27th June 1935.

Hindle (E.). **Relapsing Fever : some recent Advances.** [A Review of the Literature.]—*Trop. Dis. Bull.* **32** no. 5 pp. 309–327, 2 pp. refs. London, May 1935.

PIRES (R. E.). **Contribuição para o estudo dos Anophelinos do grupo *Nyssorhynchus* (Diptera, Culicidae) do Estado de São Paulo.** [A Contribution to the Study of the Anophelines of the *Nyssorhynchus* Group in the State of S. Paulo.]—Thesis, Fac. Med. S. Paulo, 89 pp., 5 charts, 25 figs., 76 refs. S. Paulo, 1934.

Records of malaria infection in species of the group *Nyssorhynchus*, the only Anophelines native to Brazil that are vectors, are briefly noted. Some of the literature on the synonymy and classification of the members of this group is discussed. The author has studied the males of the species of this group in São Paulo, as the male terminalia are a constant character. He also deals briefly with other morphological characters of each species, its varieties and variations. Nearly all are subject to great regional variation so that it is not possible to give a specific description applicable to wide geographical regions. Studies in faunistically limited regions are therefore necessary for the determination of the species and their varieties.

The species in São Paulo belong to the series of *A. argyritarsis*, R. D., *A. tarsimaculatus*, Goeldi, and *A. rondoni*, Neiva & Pinto. The first comprises *A. albitarsis*, Arrib., *A. albitarsis* var. *braziliensis*, Chagas, *A. argyritaris*, and *A. darlingi*, Root, which is considered a variety of *A. argyritarsis*. The second comprises *A. tarsimaculatus* var. *gorgasi*, D. & K. (Townsend's *tarsimaculatus*, auct. [*cf. R.A.E.*, B **21** 149]), *A. tarsimaculatus* var. *oswaldoi*, Peryassú, *A. bachmanni*, Petrocchi, and *A. bachmanni* var. *strodei*, Root, and the third is only represented by *A. rondoni*.

HOFFMANN (C. C.). **La formación de razas en los *Anopheles* mexicanos. I. *A. maculipennis* y *A. quadrimaculatus* y una raza nueva del *maculipennis*.** [The Formation of Races in Mexican *Anopheles*. I. *A. maculipennis* and *A. quadrimaculatus* and a new Race of *maculipennis*.]—*An. Inst. Biol. Univ. Mex.* **6** no. 1 pp. 3–22, 20 figs., 31 refs. Mexico, D.F., 1935. (With a Summary in German.)

The range of *Anopheles quadrimaculatus*, Say, which is found in the southern and south-eastern United States, continues directly into Mexico along the Gulf coast southwards to about Tuxpan, Veracruz, in a moist, hot climate. Further south, as in the port of Veracruz, its occurrence is temporary and sporadic.

Records of *A. quadrimaculatus* inland, on the southern edge of the Mexican plateau, in the States of Guanajuato and Michoacan and in the High Valley of Mexico actually concern a race of *A. maculipennis*, Mg., here described from the adult, egg and larva as *aztecus*, n. This occurrence of *A. maculipennis* is normal, as these regions have a cold, dry winter climate. The new race is close to the western races hitherto known only from California and New Mexico.

The author considers that at the end of the last ice age *A. maculipennis* inhabited all the accessible circumpolar regions, including those in North America and to the south in areas on the Pacific coast and on the gulf of Mexico. As the ice withdrew, it retreated northwards along the Pacific and also up the mountains in the interior and the south. It has now crossed Canada to the Atlantic coast, and in the south it has reached an altitude of 5,600 ft. in New Mexico and about 7,500 ft. in the Valley of Mexico. It is not found in the eastern United States nor on the Gulf of Mexico, the species occurring there being *A. quadrimaculatus*, breeding in fresh water, *A. atropos*, D. & K., breeding in

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brackish water, *A. barberi*, Coq., breeding in tree-holes, and *A. walkeri*, Theo. The *quadrimaculatus* group appears to have separated from *maculipennis* recently, as is the case in the Old World with *A. sacharovi*, Favr (*elutus*, Edw.). The ancestral group of *quadrimaculatus* met climatic conditions very different from those of the forms of *maculipennis* on the Pacific coast and lived always in a very moist environment that favoured the formation of lagoons of fresh water and brackish water, causing the separation of *quadrimaculatus* and *atropos*.

The above views should explain the geographical relationship of the new race, *aztecus*, and its occurrence in the Valley of Mexico. Though found throughout the year, it appears to be most numerous in the dry season. Females occur in dwellings in winter also. The males are rare or disappear during the cold season, during which the larvae persist. They occur in canals, irrigation channels and pools with clean water and abundant Protozoa, sometimes in association with *A. punctipennis*, Say. They are gradually replacing *A. pseudopunctipennis*, Theo., around Mexico City, as they do not require such clean water. Mating and oviposition have been observed in the laboratory at 18–20°C. [64·4–68°F.].

SINTON (J. A.) & MAJID (S. A.). **The Dispersion of Anopheline Larvae by the Flow of Streams, and the Effect of Larvicides in preventing this.**—*Rec. Malar. Surv. India* **5** no. 1 pp. 3–17. Calcutta, March 1935.

Although all water collections within half a mile radius of a village near Karnal, Punjab, were treated every 5–7 days with Paris green, the numbers of adult Anophelines did not diminish to the extent that had been anticipated. As large numbers of older larvae and pupae could be collected on the day after dusting in a large shallow channel about 60–65 feet wide running through the middle of the controlled area, the experiments described were undertaken to determine to what extent they were drifting down the stream from places outside the controlled area. A strip of muslin about a yard wide was stretched across the stream and so tied to two lines of stakes placed 5 feet apart that it formed a series of bag-like bays into which the larvae and pupae floated and from which they were removed every hour. There were great variations in the numbers caught from day to day and hour to hour, the number of larvae caught per hour ranging from 179 to 3,989, with an average of about 790, and the number of pupae from 0 to 56, with an average of about 5. The number of hours the net was in position totalled 24, during which time nearly 19,000 larvae and 129 pupae were collected. Most of these were identified as *Anopheles culicifacies*, Giles, the most dangerous malaria vector in this region of India. Larvicidal fish were numerous, but the larvae were protected by floating vegetation and other débris.

Further experiments were undertaken to determine whether the number of larvae drifting into an area could be reduced by continuous oiling by means of " oil balls." These were sacks filled with sand or balls of such material as palm fibre, impregnated with waste lubricating oil. One impregnated with 3 gals. oil was placed at each margin of the stream 100 yards above one of the positions for the net. The average hourly catch for the three hours immediately preceding the placing of the balls was 2,012 larvae and 9 pupae, whereas 20½ hours after it was 121 larvae and 5·3 pupae. Ten days later the average hourly catch

below the oil balls was 20 larvae and 0·8 pupae, whereas a few yards above the oil balls it was 371 larvae and 5 pupae.

As oil penetrates floating masses of algae with difficulty and it was thought that the larvae embedded in them might often escape destruction, experiments were carried out in which a boom 2½ inches in diameter, made of the dried stems of long grass bound with the fibrous portions of their leaves, was placed across the stream to prevent the masses of algae entering the controlled area and with the hope that the accumulation of the oil film above the boom would intensify its action. Collections of larvae made before and after the placing of the boom showed that by itself it had a temporary effect in checking the drift of the larvae but that a boom of larger diameter would probably be more effective since a certain amount of material passed under it when the pressure became great. Moreover, it would seem advisable to spray the débris collected behind the boom with oil and remove it about every 5 days. Two oil balls each impregnated with ½ gal. waste lubricating oil were placed about 100 ft. upstream and the water surface between the balls and the boom treated with another gallon of oil. When the net was placed for one hour 50 feet below the boom and for one hour 20 feet above the oil balls, the collections were 72 larvae, and 2,087 larvae and 58 pupae respectively. Five days later 375 larvae and 3 pupae were caught 50 feet below the boom. It was found that disturbance of the water above the boom caused the oil collected behind it to slop over and drift downstream. This might be prevented by using a thicker boom rising higher above the water.

A part of the stream above the oiled area was dusted for about 100 yards with a 5 per cent. mixture of Paris green at the rate of ½ lb. to the acre. Three hours later the number of drifting larvae had been considerably reduced, but after five days, it had increased to almost the highest hourly catch obtained in the experiments. Thus if Paris green were used as a routine measure every 5 days, it would probably prove relatively ineffective.

KARAMCHANDANI (P. V.). **The Effect of Heat and Atmospheric Humidity on all Stages of** *Culex fatigans*.—*Rec. Malar. Surv. India* **5** no. 1 pp. 23–38, 3 figs., 7 charts, 8 refs. Calcutta, March 1935.

The experiments described were carried out in London with a strain of *Culex fatigans*, Wied., from India (where this mosquito is a vector of *Filaria bancrofti*) with a view to determining the effect of temperature on the immature stages and of temperature and humidity on the adults. The technique used in handling the mosquitos is described and the apparatus illustrated. Batches of eggs, larvae and pupae were exposed to a given temperature for 1 hour and batches of adults for 1, 3 and 6 hours at humidities of 0, 30, 60 and 90 per cent. At 39·8°C. [103·64°F.] or below all eggs hatched, but above this temperature none hatched. Below 36°C. [96·8°F.] larvae did not seem to be affected by the heat, but at 38°C. [100·4°F.] and above all died. Below 38°C. all pupae survived, but above 40°C. [104°F.] all succumbed. The resistance of the adults to temperature increased as the humidity became higher, the upper limit being 37·4°C. [99·32°F.] at 0 per cent. and 39°C. [102·2°F.] at 90 per cent. The lethal temperature was a degree or so lower for males than for females, but the same for engorged or unengorged females. The death point for exposures of 3 and 6 hours did not differ very greatly from that for 1 hour. For exposures of

1–6 hours the adults survived rather higher temperatures in moister than in drier air, and various weighing experiments showed that this was due to evaporation. Males lost proportionately more weight than females, and as they died at lower temperatures, it is concluded that they are less able to conserve water.

Lindberg (K.). **Notes on Malaria on the Barsi Light Railway (Deccan).**—*Rec. Malar. Surv. India* **5** no. 1 pp. 51–95, 3 graphs, 10 refs. Calcutta, March 1935.

A detailed account is given of 3½ years' work on the malaria situation on the Barsi Light Railway, which runs from Miraj, Bombay Presidency, to Latur, Hyderabad State. The breeding places and the geographical and seasonal distribution of the 18 species of *Anopheles* observed are recorded. *A. culicifacies*, Giles, is the only one that is considered to be of any great importance in the transmission of the disease. As it breeds chiefly in pools in stream beds, the conversion of such beds into concrete channels for a certain distance on either side of villages is one of the anti-malaria measures recommended.

Sen (P.). ***Anopheles* breeding in Relation to Rice Cultivation in Lower Bengal.**—*Rec. Malar. Surv. India* **5** no. 1 pp. 97–108, 8 charts, 12 refs. Calcutta, March 1935.

The observations recorded were carried out from 1932 to 1934 in and near three villages that are considered typical of the deltaic region of lower Bengal, with a view to determining to what extent rice-fields afford breeding places for the species of Anophelines that are associated with malaria. The water collections in the villages, which consisted of reservoirs, ponds, ditches and drains, more or less overgrown with aquatic vegetation, were examined once a fortnight and the results compared with similar examinations made during the rice-growing season of the water accumulations in rice-fields, which were comparatively clear and free from floating vegetation. Of the 42,549 Anopheline larvae collected, 37,672 were from 397 breeding places in the villages and 4,877 from 136 breeding places in rice-fields. The 12 species observed included the following vectors of malaria: *A. varuna*, Iyen., and *A. annularis*, Wulp, which were both found in village water collections and rice-fields in all three localities; *A. philippinensis*, Ludl., which was absent in one of the localities and constituted less than one per cent. of the catch in the other two, though it occurred in both types of breeding places; and *A. culicifacies*, Giles, which never occurred in rice-fields and was uncommon in village breeding places. The distribution, seasonal prevalence and relative density of the species are shown. Rice is cultivated to almost the same extent in each village, but the spleen rates were approximately 50, 10 and 0 per cent., so that there can be no direct correlation between rice cultivation and malaria.

Russell (P. F.) & Gaisas (F. E.). **Habitats of Philippine *Anopheles* Larvae.**—*Philipp. J. Sci.* **55** no. 4 pp. 297–306, 5 pls., 15 refs. Manila, 8th March 1935. **A Practical Illustrated Key to Larvae of Philippine *Anopheles*.**—*T.c.* pp. 307–336, 33 pls., 5 figs., 14 refs.

In the first paper, a brief discussion of the general types of breeding places found in the Philippines is followed by notes on the habitats of

the larvae of the 27 species or varieties of Anophelines, based mainly on collections made from January 1930 to September 1934 in every province in the Islands under varying conditions of altitude and season. Information based on some of the collections has already been noticed [*R.A.E.*, B **21** 50; **22** 258].

The second paper is a guide to the identification of the fourth-instar larvae of 28 species or varieties of Anophelines found in the Philippine Islands, three of which are unnamed. It consists of a table showing classification and synonymy, brief descriptive notes on each species, a dichotomous key and numerous illustrations.

Madsen (D. E.) & Knowlton (G. F.). **Mosquito Transmission of Equine Encephalomyelitis.**—*J. Amer. vet. med. Ass.* **86** no. 5 pp. 662–666, 3 refs. Chicago, Ill., May 1935.

In the course of further work on possible vectors of equine encephalomyelitis in Utah [*cf. R.A.E.*, B **22** 248], the western strain of the virus was transmitted from infected to healthy guineapigs twice by the bites of *Aëdes nigromaculis*, Ludl., and once by the bites of *Aëdes dorsalis*, Mg., the results being confirmed by subinoculations into guineapigs and in the first two cases into horses. In further instances paralysis and other symptoms suggested that the virus had been transmitted by the bites of mosquitos but subinoculations failed to produce conclusive evidence.

Roubaud (E.). **Vie latente et condition hibernale provoquées par influences maternelles chez certains invertébrés.**—*Ann. Sci. nat. Zool.* (10) **18** pp. 39–51, 1 fig. Paris, 1935.

The following is taken from the author's conclusions. The phenomena of true diapause in invertebrates do not depend on external influences in their immediate physiological determinism. It is maternal age [*R.A.E.*, B **16** 183] or the production of an excess of toxins resulting from the lengthy action of the organism that produces torpid characters in the offspring [**14** 123, etc.]. The torpid descendants may either be affected by a slackening of larval development, as in *Anopheles plumbeus*, Steph. [**22** 187], or, more usually, by a sudden interruption in development at a stage generally preceding an important change, such as hatching or metamorphosis. The slackening in development due to an ageing of a few days in the mother may entail a delay of a year in the development of the offspring. Heat does not accelerate the cycle so long as the reactivation of the asthenic individuals does not occur under the influence of rest. The torpid defects received directly from the maternal organism necessitate rest by retarded metabolism or by latent life. In most cases the over-taxed organisms die if maintained in conditions of active life at a high temperature. It is winter cold, or in some cases an equivalent condition, anhydrobiosis [A **16** 300; B **18** 36], both factors of repose, that save the retarded organisms by allowing a slow elimination of the toxins preventing their development. Hibernation is thus in many instances not the cause of torpor but the natural means of its disappearance.

Entomological Investigations.—*Rep. Coun. sci. industr. Res. Aust.* **8** (1933–34) pp. 16–23. Canberra, 1935.

Much of the information contained in this summary of the work carried out in Australia during 1933–34 by the Division of Economic

Entomology of the Council for Scientific and Industrial Research has been noticed from other sources.

In addition to the usual blowflies, *Muscina stabulans*, Fall., and a species of *Sarcophaga* have been bred from living sheep at Canberra. The raw fleece of sheep is composed of suint, wax, dirt and fibre; experiments showed that blowfly maggots would not grow in the suint fraction, although they developed slowly in the dirt fraction, which contained a considerable quantity of insoluble protein. Experiments on the poisoning of carcasses for preventing the development of blowfly maggots indicated that sodium fluoride diluted with 2–4 parts of an inert dust is almost completely effective when applied to a shorn carcass, but is somewhat less so when the wool is long. Sheep jetted with sodium arsenite (0·7 per cent.) or Paris green (1 per cent.) were protected from strike for 2–3 weeks; when calcium arsenite (1 per cent.) was used, they were protected for more than 4 weeks and the strikes that occurred were limited in extent and did not require dressing.

In eight experiments in which large numbers of freshly bred examples of *Stomoxys calcitrans*, L., that had previously fed on calves infected with *Anaplasma marginale* [*cf.* *R.A.E.*, B **21** 283] were allowed at varying intervals to bite healthy calves, no infection was induced. Experiments in which a needle was jabbed alternately into the backs of infected and healthy cattle suggested that the failure was due to the length of the interval between bites (minimum 9 seconds) and partly to the shallow penetration of the proboscis. An attempt to transmit *Piroplasma bigeminum* by allowing 53 examples of *S. calcitrans* fed on an infected calf to bite a healthy one was also unsuccessful.

Buxton (P. A.). **Changes in the Composition of Adult** *Culex pipiens* **during Hibernation.**—*Parasitology* **27** no. 2 pp. 263–265, 1 fig., 5 refs. Cambridge, 29th June 1935.

An accumulation of fat in autumn is characteristic of mosquitos that hibernate as adults, but little is known of the quantity of fat stored or of the rate at which it disappears in the course of the winter. To elucidate these points, observations were made on females of *Culex pipiens*, L., collected in a rural cellar in Kent at intervals from September to April in the years 1930–34. These insects were killed, dried to a constant weight at 105°C., and treated with ether in a Soxhlet apparatus. It was assumed that what is lost at 105°C. is water and what is dissolved in ether is fat, although neither assumption is strictly accurate. From 2 to 5 collections of 40–100 females were examined each month. The results are shown in a table giving the mean monthly values per female in milligrams. In the course of hibernation there is a gradual reduction of the female's total weight from over 3 to under 2 mg. Towards the end of the period, particularly in March and April, the figure for fat falls to about one-seventh of that obtained in September and October, and it is thought that this residual ether-soluble fraction is not fat but other lipoids. The solids other than fat show remarkably little change in weight.

Changes in the proportions of the various substances present in the insect are discussed, and it is assumed that as the fat disappears the space that it occupied is partly filled by an increased amount of air in the diverticula, so that the insect's loss of weight is greater than the reduction in its size.

EVANS (A. C.). **Studies on the Influence of the Environment on the Sheep Blow-fly, *Lucilia sericata* Meig. II. The Influence of Humidity and Temperature on Prepupae and Pupae.**—*Parasitology* **27** no. 2 pp. 291–298, 6 figs., 3 refs. Cambridge, 29th June 1935.

The following is the author's summary: Prepupae and pupae are shown to lose weight more rapidly at low than at high humidities. This more rapid loss of weight is due to loss of water alone and not to loss of dry matter.

The limits of temperature and humidity which each of the two stages can survive have been mapped out. If the metamorphic period as a whole is considered, it is likely that the limits of temperature and humidity for survival and development will be narrower than for each stage considered alone.

EVANS (A. C.). **Studies on the Influence of the Environment on the Sheep Blow-fly, *Lucilia sericata* Meig. III. The Influence of Humidity and Temperature on the Adult.**—*Parasitology* **27** no. 2 pp. 299–307, 4 figs., 9 refs. Cambridge, 29th June 1935.

The following is the author's summary: The length of life at various humidities of unfed flies and of flies fed for 1 day and 6 days on diets of meat, sugar and water, sugar and water, meat and water, and water alone, is discussed. The continued feeding of flies on a diet of meat, sugar and water brings about a shortening of their life at all humidities when the flies are starved, owing to their increased rate of metabolism. Flies fed on sugar and water are more resistant to humidity than flies fed on meat, sugar and water, and females are more resistant than males. Flies fed on meat, sugar and water lose weight more rapidly than flies fed on sugar and water.

High humidity is more favourable for growth of the ovaries than low humidity. Humidity has no effect on oviposition at temperatures of 10–35°C. [50–95°F.], but at 40°C. [104°F.] low humidity is unfavourable.

SÉGUY (E.). **Etudes sur les mouches domestiques de la Vallée du Loing. Systématique. Biologie. Parasitologie. Mesures répressives contre ces insectes.**—*Bull. Ass. Nat. Loing* **16** no. 3–4 pp. 85–144, 14 figs., many refs. Moret, 1933. [Recd. June 1935.]

This popular account of Diptera that attack man and domestic animals in the Loing valley includes a key to the genera. The various stages of the species are described, with short accounts of their life-history and natural enemies and of the usual methods of control.

SEARLS (E. M.) & SNYDER (F. M.). **The Control of some Ectoparasites of Laboratory Rats by atomized Pyrethrum Extracts in Oil.**—*J. econ. Ent.* **28** pp. 304–310, 1 fig., 2 refs. Geneva, N. Y., April 1935.

The following is substantially the author's summary: Efficient control of *Polyplax spinulosa*, Burm., on rats was effected by the use of an atomised spray of an oil containing 2 per cent. of an oil extract of pyrethrum adjusted to 2·1 per cent. pyrethrins. Each rat was effectively covered by 5 cc. of the spray. Its efficiency was not increased by raising the percentage of extract to 5. About 81 per cent. of the mites on the rats were destroyed by the spray. The rats were

not injured. Immersion in 2 per cent. extract destroyed all lice, but tended to injure the rats. *Cimex lectularius*, L., was destroyed when 5 per cent. extract was sprayed upon occupied cages.

KNIPLING (E. F.) & TATE (H. D.). **An Outbreak of the Screw Worm,** *Cochliomyia americana* **Cushing and Patton, in north-western Iowa.**—*J. econ. Ent.* **28** no. 2 pp. 472–475, 1 fig., 1 ref. Geneva, N.Y., April 1935.

In September 1934 numbers of larvae of *Cochliomyia hominivorax*, Coq. (*americana*, Cush. & Patt.) were taken from wounds on domestic animals in Iowa, where this fly has not previously been recorded. Its probable distribution in the north-western part of Iowa and in the part of South Dakota immediately adjacent is discussed. Cattle, principally newborn calves, were the animals most often infested, although horses, sheep, pigs, dogs and fowls were also attacked, approximately in that order of frequency. Myiasis was most often observed between 8th August and mid-October, and examples of *C. hominivorax* were received from one case as late as 21st October. In previous years, although the number of cases of myiasis reported was small, they usually seemed to be more numerous in late spring and early summer.

BISSELL (T. L.). **The Screw Worm.**—*Bull. Georgia Exp. Sta.* no. 189, 11 pp., 5 figs. Experiment, Ga, April 1935.

An account is given of the morphology, bionomics and control of the screw-worm fly, *Cochliomyia hominivorax*, Coq., which has until recently been confused with *C. macellaria*, F. [*cf. R.A.E.*, B **23** 11]. It first appeared in Georgia in the summer of 1933 and by the end of 1934 had spread over all but the northern fourth of the State. The number of cases of domestic animals infected during these years is estimated at 575,000, with 75,000 deaths. Before this time the fly was confined to the south-western States and tropical America, with occasional isolated outbreaks in the middle western States, but Florida, Alabama and South Carolina have also been invaded recently. Wounds on any part of the body of warm-blooded animals are attacked. The maggots, which hatch in less than 12 hours from eggs laid on the edge of a wound, live in the wound for 5–6 days, enlarging it, destroying sound flesh, and often burrowing until they reach a vital organ or open the body cavity. They produce a substance that is poisonous to the animal and from infested wounds there is a foul-smelling discharge that attracts more flies and induces further oviposition. The mature maggots pupate in the soil and adults emerge in 3–14 days. Under favourable conditions 9–10 generations may occur in a year. In Georgia in 1933–34, cattle, pigs and mules were most often attacked, although dogs and wild deer were also commonly infested. Cases are found among sheep and goats wherever they are raised in large numbers. Numerous cases have occurred in man in Georgia, a few of which have proved fatal. In 1934 the fly appeared in late May ; injury practically ceased in November, although isolated cases were reported in the southern counties throughout the winter. The average fly-free season when operations may be performed on animals is from 15th November to 1st May [*cf.* **3** 160]. Efforts should be made to prevent wounds and to treat immediately those that do occur [*cf.* **3** 160 ; **14** 26, 43, 165].

Mumford (E. P.) & Adamson (A. M.). **Entomological Researches in the Marquesas Islands.**—*Mém. Soc. Biogéogr.* **4** pp. 218–234, 3 pls., 2 maps, 29 refs. Paris, 1934. [Recd. June 1935.]

This paper includes a note on *Simulium buissoni*, Roub., which occurred on only two of the islands, and bit fiercely from sunrise to sunset.

Stewart (J.). **Predilection of specific Trypanosomes for certain Animals.**—*Vet. J.* **91** no. 5 pp. 218–219. London, May 1935.

In 1934, owing to the extensive flooding of the Naboggo River, *Glossina tachinoides*, Westw., penetrated a cleared area near Pong-Tamale, Gold Coast [*cf. R.A.E.*, B **22** 237], and began to breed in the vicinity of a water-hole in a banana plantation adjacent to a pig and cattle farm. The plantation is four acres in extent, but no pupae were found more than 25 feet from the water-hole, although shade conditions and the humidity of the ground were identical throughout. A number of pigs and 24 cattle became infected with trypanosomiasis. *Trypanosoma vivax* occurred in 16 of the cattle, unidentified trypanosomes, probably this species, in 2 others, *T. congolense* in 3, and *T. brucei* in only 1, whereas all the 17 cases in pigs were due to *T. brucei*. Of 13 tsetse flies taken at the farm 3 were infected, 2 with *T. vivax* and the other with probably the same species. In game and all livestock other than pigs in this area, *T. vivax* is the common trypanosome, causing 90 per cent. of the cases observed.

Jack (R. V.). **Annual Report for the Year 1933 : Entomological Branch.**—Fol., mimeographed, 18 pp. Salisbury, Agric. Lab. [1935.]

In the medical and veterinary section of this report (pp. 9–15) details are given of the situations in 1933 in localities in Southern Rhodesia where operations against tsetse fly [*Glossina morsitans*, Westw.] are in progress [*cf. R.A.E.*, B **21** 222]. No effective bactericide has been discovered for use in deep wounds in cattle infested with larvae of *Chrysomyia bezziana*, Villen., and during tests it was found that the repellent action of various substances, including Stockholm tar, was not strong enough to overcome the attraction exerted by the gases produced in many large wounds. Studies were made of the habits of the blood-sucking flies, *Philaematomyia crassirostris*, Stein, *Lyperosia minuta*, Bezzi, and *Stomoxys* sp., which attack domestic animals. *Rhipicentor gladiger*, Neum. (*bicornis*, Nutt. & Warb.), which was taken on a dog, has not previously been recorded from Southern Rhodesia.

Bevan (L. E. W.). **Notes on the Human Trypanosomiasis of Southern Rhodesia.**—*J. comp. Path.* **48** pt. 2 pp. 97–111, 20 refs. Croydon, June 1935.

An account is given of the history of *Trypanosoma rhodesiense*, and its nature is discussed. From 1912, when sleeping sickness was first reported from Southern Rhodesia [*R.A.E.*, B **1** 183], to the present time, there have been 7 cases in Europeans, all of whom contracted the disease in the Sebungwe and West Hartley districts, and at least 49 in natives, although there has been no epidemic. Several cases in Europeans and natives occurred in 1934. Surveys in the same year

failed to reveal cases in the areas infested by *Glossina morsitans*, Westw., in the Lomagundi and Darwin Districts or in north Sebungwe. Three cases in natives, two of whom were carriers, were, however, discovered at Gowe on the Sebungwe bank of the Umniati River, and as one of the European and some of the native cases could be traced to this village, it is considered to have been the focus of the recent outbreak. This locality is one in which the fly survived after the rinderpest outbreak of 1896, and it was in a similar area that the sleeping sickness cases were found in 1913 [*cf. loc. cit.*]. In such places the natives would be liable to infection from birth, immunity would be maintained by constant reinfection and consequently carriers would be likely to occur. Other parts of the country appear to be free from infection, and it is suggested that the disease could be eliminated from Southern Rhodesia by evacuating certain restricted areas and using Bayer 205 as a prophylactic.

NAPIER (L. E.). **The Transmission of Kala-azar in India.**—*Indian med. Gaz.* **70** no. 5 pp. 269–272, 11 refs. Calcutta, May 1935.

The author discusses the evidence supporting the theory that in India kala-azar is transmitted by *Phlebotomus argentipes*, Ann. & Brun., and considers that as the factor of human resistance is obviously high in the case of this disease, no great importance need be attached to the apparent failure of experiments on transmission to man by bites of the sandfly. He has suggested that dermal infections are constant sequels to the visceral infections, though only a small percentage of them produce clinical symptoms, and that although it may be difficult to demonstrate such skin infections histologically, sandflies become infected when fed on them. This theory is supported by unpublished investigations of R. O. A. Smith, in which laboratory-bred sandflies became infected in considerable numbers when fed on clinically cured kala-azar patients in the convalescent stage, in whose blood cultures *Leishmania donovani* could not be demonstrated. Moreover, several sandflies became infected after feeding on a man who had kala-azar a year previously but had shown no clinically apparent dermal lesions.

BARBER (M. A.). **A Method of Detecting the Eggs of *Anopheles* in Breeding Places and some of its Applications.**—*Riv. Malariol.* **14** no. 2 pp. 146–149. Rome, 1935. (With a Summary in Italian.)

The method consists in skimming the surface of the water with a pan and straining the contents of the pan through a thumbless mitten of white muslin worn on the left hand. The material collected on the muslin is immediately examined with a hand lens. The mitten should be large enough to allow the hand to be cupped easily, so that the film on the water may be concentrated. To convey eggs to the laboratory several mittens or squares of white cloth that can be placed over the mitten may be used.

MISSIROLI (A.). **Osservazioni sulla biologia dell' *Anopheles plumbeus*. I Nota.**—*Riv. Malariol.* **14** no. 2 pp. 150–154, 2 figs., 4 refs. Rome, 1935. (With a Summary in English.)

Numerous larvae of *Anopheles plumbeus*, Steph., have been found in the Alban hills, in dark cavities in rocks where rainwater is collected

for drinking purposes. The temperature of the water was 9–10°C. [48·2–50°F.]. They did not occur in a cavity containing spring water or one that was fairly well lit and in which larvae of *A. claviger*, Mg. (*bifurcatus*, auct.) were common. It appeared that the negative phototropism noted in the larvae of *A. plumbeus* also influenced the adults in the choice of water for oviposition. The water in which the larvae were found contained very numerous bacteria, many protozoa and a a few algae, whereas that in the dark cavities without larvae contained no algae, few protozoa and very few bacteria. The larvae of *A. plumbeus* feed at and below the surface of the water and sometimes at the bottom. Roubaud's finding that the winter larvae undergo a diapause independent of external conditions [*cf. R.A.E.*, B **22** 187, etc.] was confirmed. These larvae possess a remarkable reserve of fat.

DE BUEN (E.) & GIL COLLADO (J.). **Nota sobre la fecundación del** *Anopheles maculipennis* **var.** *labranchiae* **en casetas de estudio de mosquitos.** [A Note on the Fertilisation of *A. maculipennis* var. *labranchiae* in experimental Cages.]—*Riv. Malariol.* **14** no. 2 pp. 155–166, 5 figs. Rome, 1935. (With a Summary in Italian.)

For some years *Anopheles maculipennis* var. *atroparvus*, van Thiel, has been bred in captivity in Spain. In 1933 and 1934 attempts were made to breed var. *labranchiae*, Flni., and var. *melanoon*, Hackett. A detailed account of the experiments is given. It was found that neither *melanoon* nor *labranchiae* were fertilised in cages of about 70 cu. ft. in the open air or in a room of about 2,800 cu. ft. Further experiments were made in a cage of metal gauze measuring about 20 × 17 × 7 ft. and containing a pool, a hollow oak trunk, various plants, a small building imitating ordinary animal quarters, and a pig or rabbit. Larvae of *melanoon* placed in this cage during the first week of August failed to give rise to adults. In September larvae of *labranchiae* gave rise to adults, and these seemed to have mated, but the females died before ovipositing. In a second attempt the nuptial flight of adults originating from eggs of *labranchiae* placed in the cage on 13th October occurred at about 3 ft. above the water in the pool. On 8th December eggs with the characteristics of *labranchiae* were collected in the cage, and these eggs afterwards gave rise to larvae.

FACCIOLI (D.). **Sulle varietà di** *Anopheles maculipennis* **presenti nella piana di S. Eufemia (Calabria).** [On the Varieties of *A. maculipennis* in the Plain of S. Eufemia, Calabria.]—*Riv. Malariol.* **14** no. 2 pp. 167–184, 1 sketch map. Rome, 1935. (With a Summary in English.)

The varieties of *Anopheles maculipennis*, Mg., found in the plain of S. Eufemia on the West coast of Calabria were *maculipennis* (*typicus*), *labranchiae*, Flni., *messeae*, Flni., and *melanoon*, Hackett, as well as *A. sacharovi*, Favr (*elutus*, Edw.), which is also regarded as a variety of *A. maculipennis*. Extensive observations on their absolute and relative prevalence in houses and animal quarters are tabulated and compared. All the races were more abundant in animal quarters, but *sacharovi* and *labranchiae* were more numerous in houses than the others, and as *labranchiae* was predominant, it must be considered

responsible for the hyperendemic malaria in the district. Observations of 1,133 ovipositions by *labranchiae* showed that there were many eggs differing from the typical ones. Some were as large as those of *messeae*, others were slender like those of var. *maculipennis*, and there were also differences in the markings.

The greatest number of ovipositions was by mosquitos captured in animal quarters. The maximum percentage of ovipositions by zoophilous varieties (*maculipennis*, *melanoon*, *messeae*) occurred in September, then, in order of decreasing abundance, in June, July and August. With the anthropophilous varieties (*labranchiae*, *sacharovi*) exactly the opposite occurred. In the case of females taken in dwellings, on the other hand, the zoophilous varieties had the highest percentage of ovipositions in July and the lowest in August, and the anthropophilous varieties had the maximum in August and the minimum in July.

Compagnini (G.). **Contributo alla biologia dell'*Anopheles maculipennis*.** —*Riv. Malariol.* **14** no. 2 pp. 185–191. Rome, 1935. (With a Summary in English.)

Although the various races of *Anopheles maculipennis*, Mg., can be distinguished by differences in the ground-colour and design of the exchorion, observations in Calabria gave an instance of a deviation from this rule. Some eggs that appeared colourless to the naked eye and brassy yellow under a lens were found among eggs with the normal differences. Of 21 mixed depositions 3 came from *maculipennis* (*typicus*), 5 from *messeae*, Flni., 8 from *labranchiae*, Flni., and 5 from *A. sacharovi*, Favr (*elutus*, Edw.), which the author considers a variety. Adults collected in animal quarters and those taken from houses both laid some yellow eggs, and the abnormality did not seem to depend on either light or temperature. These abnormal eggs were found on the sides of the test-tubes and sometimes among normal eggs on imperfectly wetted pads of cotton-wool. The only constant circumstance was that eggs laid on dry surfaces in the test-tubes were invariably brassy yellow. The eggs hatched normally under favourable conditions.

Tilli (P.). **Esperimenti pratici di disanofelizzazione idrica nell'Agro Romano mediante la calciocianamide.** [Practical Experiments in the Control of Anopheline Larvae near Rome with Calcium Cyanamide.]—*Riv. Malariol.* **14** no. 2 pp. 192–200, 6 refs. Rome, 1935. (With a Summary in French.)

In continuation of previous work [*R.A.E.*, B **21** 275], calcium cyanamide was tested on a large scale as an Anopheline larvicide in Central Italy. In experiments at Ardea, the chemical was mixed with road dust at rates of 20, 40 and 50 per cent. The strongest mixture was the most effective, since applications had to be made only at intervals of 15–20 days. It destroyed the larvae of *Culex* as well as those of Anophelines, and it freed the banks of the canals from grass. In the salt marshes near Ostia it caused high mortality among Anopheline pupae, and the few adults that did emerge were unable to fly. The results of the previous experiments were confirmed, but it was also found that this larvicide is highly toxic to *Gambusia* and frogs. The mixture should be made with dry dust the day before use. As it is likely to cause severe irritation, gloves and goggles should be worn by

the people applying it. Calcium cyanamide injures the plankton, on which the larvae of Anophelines feed.

[**Mosquito Control Work in 1934.**]—*Proc. N. J. Mosq. Ext. Ass.* **22** 189 pp., 4 figs., refs. New Brunswick, N.J., 1935.

In addition to reports on local mosquito situations and control work in New Jersey, Utah, Delaware, Connecticut, New York State and New York City, the following papers are included : Mosquito Work throughout the World in 1934, by F. C. Bishopp & C. N. Smith (pp. 50–77); Mosquito Suppression Work in Canada in 1934, by A. Gibson (pp. 77–91) ; Relations of Mosquito Control in New Jersey to Bird Life of the Salt Marshes, by C. A. Urner (pp. 130–136) ; The Relation of Mosquito Control to the Muskrat Industry on the Salt Marshes, by W. S. Corkran (pp. 137–141) ; The Relation of Mosquito Control in New Jersey to the Presence of Game on the Salt Marshes, by H. J. Burlington (pp. 141–142) ; The Relation of Mosquito Control in New Jersey to Oyster Production on the Salt Marshes, by T. C. Nelson (pp. 142–144) ; Summary of Symposium on the Relation of Mosquito Control in New Jersey to Wild Life on the Salt Marshes, by T. J. Headlee (pp. 144–146) ; The New Jersey Mosquito Problem, a Survey of past Performance, present State and future Outlook, by T. J. Headlee (pp. 151–161) ; Larvicides, and a Method for temporary Protection from Adult Mosquitoes in limited Areas, by J. M. Ginsburg (pp. 147–151) ; and The practical Importance of how to get, and how to use an accurate Picture of daily Mosquito Conditions on a County-wide Basis, by R. J. Van Derwerker (pp. 164–170).

In the paper by Ginsburg, it is stated that further experiments on pyrethrum larvicides [*cf. R.A.E.*, B **23** 25, 151] have resulted in the evolution of an improved emulsion that can be used on fresh or salt water. It is as toxic to mosquito larvae and pupae as the larvicide made with soap and costs practically the same. The formula is 100 U.S. gals. kerosene containing pyrethrum extract equivalent to 100 lb. flowers, 50 U.S. gals. water and 6 lb. Gardinol W. A. Concentrated (sodium laurel sulphate). The flowers must contain at least 0·9 per cent. pyrethrins. To avoid the excessive foaming produced by the Gardinol, 2–3 lb. wool grease (Degras) may be dissolved in the kerosene before it is added to the mixture of water and emulsifier. If Aresket (sulphated butyl diphenyl-phenol) is used as the emulsifier in place of Gardinol, no defoaming agent is required, but only laboratory tests have been carried out with this material. For spraying, the stock emulsion should be diluted with 10 parts of water, which may be taken directly from the breeding place, regardless of its salt content. The diluted spray should be frequently shaken or mixed. Preliminary tests have shown that this larvicide can also be used as a spray over areas of grass, etc., to afford temporary protection from adult mosquitos out of doors.

In the paper by Van Derwerker data are given on the costs of running 10 mosquito traps and of their conversion from the old type [**20** 241] to the new [**23** 151], together with the numbers of mosquitos caught from June to September in 1932, 1933 and 1934. It is considered that the traps are more reliable and accurate than night collections, and that one trap to every 5 square miles of controlled territory is sufficient to give a clear picture of the prevailing mosquito situation.

WILLIAMS (C. L., & DREESSEN (W. C.). **The Destruction of Mosquitoes in Airplanes. A Preliminary Note.**—*Publ. Hlth Rep.* **50** no. 20 pp. 663–671, 1 ref. Washington, D.C., 17th May 1935.

With a view to discovering an insecticide suitable for use in aeroplanes, experiments to determine the dose of Carboxide lethal to *Aëdes aegypti*, L. [*cf. R.A.E.*, B **23** 155] were carried out at New Orleans during the latter half of 1934. The tests, of which typical ones are described, showed that this mosquito is very resistant; with an exposure of half an hour the concentration of carboxide necessary to cause death within 24 hours was between 15 and 20 lb. per 1,000 cu. ft. A longer exposure is not practical in the fumigation of aircraft, and as the containers of Carboxide are heavy and the amount of material necessary to secure a satisfactory mortality is large, this gas is not considered suitable for use in aeroplanes.

Experiments were also carried out with a concentrated extract of pyrethrum in light oil (containing 2 gm. pyrethrins per 100 cc.) using different rates of atomised spray per 1,000 cu. ft. and exposures varying from 1 hour to 5 minutes, but in the majority of cases lasting 5 and 10 minutes. The results, which are shown in a table, give the mortality at the end of 24 hours. The lethal concentration appeared to be between 2 and 4 gm. of the extract. An exposure of 5 minutes gave practically as good results as one of 10 minutes. The small amount of concentrated pyrethrum required indicates that this material would be suitable for use in aeroplanes, but it will be necessary to determine, since the mosquitos do not die at once, whether they are rendered incapable of biting. The method of rearing the mosquitos and of carrying out the experiments is briefly described. As the mosquitos were exposed in the sprayed room in cages of mosquito netting, it is probable that the effectiveness of the spray was reduced to a certain extent by absorption on the material.

RAM (Raja). **Roads and Malaria in India.**—*Indian Engng* **97** no. 4 pp. 17–21, 7 figs., 1 diagr. Calcutta, April 1935.

This paper is written to call the attention of engineers, particularly those engaged in road construction, to the numerous ways in which their work may result in the creation of Anopheline breeding places and to possible ways by which this may be avoided or remedied. If the effect of engineering projects on the local malaria situations is taken into consideration at the beginning, a small increase in the initial outlay will often save large expenses in subsequent remedial measures.

VAN VOLKENBERG (H. L.). **Parasites and Parasitic Diseases of Cattle in Puerto Rico.**—*Bull. P. R.* [*fed.*] *agric. Exp. Sta.* no. 36, 26 pp., 4 figs., 4 refs. Washington, D.C., October 1934. [Recd. June 1935.]

In the course of this bulletin short notes are given on the bionomics and control of the following Anthropod parasites of cattle: *Boophilus annulatus*, Say, *B. annulatus microplus*, Can. (*australis*, Fuller), *Lyperosia irritans*, L. (*Haematobia serrata*, R.-D.), *Cochliomyia hominivorax*, Coq. (*americana*, Cush. & Patt.), *Stomoxys calcitrans*, L., *Haematopinus tuberculatus*, Burm., *H. eurysternus*, Nitzsch, and mites causing mange.

Papers noticed by Title only.

Swan (D. C.). **Dermatitis caused by a Mite** (*Pediculoides ventricosus*) **and its Occurrence in Australia.**—*Med. J. Aust.* 1934 **2** p. 573 (reprint 8 pp.), 3 figs., many refs. Melbourne, 3rd November 1934. [Recd. July 1935.] [*Cf. R.A.E.*, B **22** 167.]

Indacochea (A. A.). **La penetración del oökineto del** *Plasmodium falciparum* **en el epitelio intestinal del** *Anopheles maculipennis.* [The Penetration of the Oökinete of *P. falciparum* into the intestinal Epithelium of *A. maculipennis.*]—*Riv. Malariol.* **14** no. 2 pp. 117–120, 1 fig., 1 pl., 4 refs. Rome, 1935. (With a Summary in Italian.)

Séguy (E.). **Tableau pour la détermination des moustiques de la Vallée du Loing.**—*Bull. Ass. Nat. Loing* **16** no. 3–4 pp. 144–147, 1 fig., 2 refs. Moret, 1933. [Recd. June 1935.]

Stiles (C. W.) & Baker (C. E.). **Key-Catalogue of Parasites reported for Carnivora (Cats, Dogs, Bears, etc.) with their possible Public Health Importance.**—*Bull. nat. Inst. Hlth* no. 163 pp. 913–1223. Washington, D.C., 1935.

Keilin (D.), Tate (P.) & Vincent (M.). **The Perispiracular Glands of Mosquito Larvae.**—*Parasitology* **27** no. 2 pp. 257–262, 2 figs., 13 refs. Cambridge, 29th June 1935.

Thompson (G. B.). **New Genera of Mallophaga. I.**—*Parasitology* **27** no. 2 pp. 281–287, 4 figs. Cambridge, 29th June 1935.

Mellanby (K.). **The Structure and Function of the Spiracles of the Tick,** *Ornithodoros moubata* **Murray.**—*Parasitology* **27** no. 2 pp. 288–290, 2 figs., 4 refs. Cambridge, 29th June 1935.

Goetghebuer (M.). **Un** *Culicoides* **nouveau** [*C. wansoni* sp. n.] **du Bas Congo.**—*Rev. Zool. Bot. afr.* **26** fasc. 4 pp. 477–478, 1 fig. Brussels, 15th June 1935.

Wanson (M.). **L'habitat du** *Culicoides wansoni* **Goetgh.** [in crab holes].—*Rev. Zool. Bot. afr.* **26** fasc. 4 pp. 479–480. Brussels, 15th June 1935.

Herrick (C. A.). **The Tick** *Ornithodoros talaje* **in Wisconsin Homes.**—*J. Parasit.* **21** no. 3 pp. 216–217. Baltimore, Md, June 1935.

Riley (W. A.). **Minnesota Records of** *Ornithodoros talaje.*—*J. Parasit.* **21** no. 3 p. 217. Baltimore, Md, June 1935.

[Paramonov (S. Ya.).] **Парамонов (С. Я.). Dipterenlarven als Mittel gegen die Gangräne, Osteomyelitis u.s.w.** [Dipterous Larvae (*Musca domestica*, L.) as a Remedy against Gangrene, Osteomyelitis, etc.] [*In Ukrainian.*]—*J. Cycle bio-zool. Acad. Sci. Ukr.* no. 3 (7) pp. 73–83, 4 refs. Kiev, 1934. (With a Summary in German.) [Recd. June 1935.] [*Cf. R.A.E.*, B **23** 57.]

[Paramonov (S.).] **Парамонов (С.). Ueber einige interessante Dipterenfunde in Armenien.** [On some interesting Diptera (including *Tabanus shelkovnikovi*, sp. n.) found in Armenia.] [*In Ukrainian.*]—*J. Cycle bio-zool. Acad. Sci. Ukr.* no. 4 (8) pp. 31–39. Kiev, 1934. (With Summary in German.) [Recd. June 1935.]

Boynton (W. H.). **Anaplasmosis in Cattle** [a review of the literature]. —*Proc. 5th Pacif. Sci. Congr. Canada 1933* **4** pp. 3047–3053, 31 refs. Toronto, 1934. [Recd. May 1935.]

Kofoid (C. A.). **American Trypanosomiasis. The Northward Extension of Brazilian Trypanosomiasis, or Chagas' Disease, among Mammals in California.**—*Proc. 5th Pacif. Sci. Congr. Canada 1933* **4** pp. 3075–3078. Toronto, 1934. [Recd. May 1935.] [*Cf. R.A.E.*, B **23** 40, etc.]

Hodgkin (E. P.). **Recent Research on Mosquitoes in Malaya.**—*Proc. 5th Pacif. Sci. Congr. Canada 1933* **5** pp. 3349–3354, 2 refs. Toronto, 1934. [Recd. May 1935.] [*Cf. R.A.E.*, B **22** 39; **21** 192, etc.]

Krijgsman (B. J.). **Veterinary Entomology in the Netherlands Indies** [a review of the literature].—*Proc. 5th Pacif. Sci. Congr. Canada 1933* **5** pp. 3357–3360, 47 refs. Toronto, 1934. [Recd. May 1935.]

Patton (W. S.). **The Blood-sucking Species of the Genus *Musca* and the Evolution of the Blood-drawing Proboscis in the Genus.**—*Proc. 5th Pacif. Sci. Congr. Canada 1933* **5** pp. 3361–3366, 5 refs. Toronto, 1934. [Recd. May 1935.] [*Cf. R.A.E.*, B **1** 209, 229; **20** 282.]

Cooley (R. A.) & Kohls (G. M.). **A Summary on Tick Parasites.**—*Proc. 5th Pacif. Sci. Congr. Canada 1933* **5** pp. 3375–3381, 2 figs., 6 refs. Toronto, 1934. [Recd. May 1935.] [*Cf. R.A.E.*, B **17** 122–125; **19** 137, 138.]

Rozeboom (L. E.). ***Culex rooti*, a new *Culex* from Panama.**—*Ann. ent. Soc. Amer.* **28** no. 2 pp. 251–253, 3 figs. Columbus, Ohio, June 1935.

Komp (W. H. W.) & Brown (C. G.). ***Culex jubifer*, a new Species of *Culex* from Panama (Diptera: Culicidae).**—*Ann. ent. Soc. Amer.* **28** no. 2 pp. 254–255, 3 figs. Columbus, Ohio, June 1935.

Hoffmann (C. C.). **Los scorpiones de México.** [The Scorpions of Mexico. Conclusion of Part II.]—*An. Inst. Biol. Univ. Méx.* **3** no. 4 pp. 283–361, 38 figs., 4 pp. refs. Mexico, 1932. [Recd. June 1935.] [*Cf. R.A.E.*, B **21** 72.]

Fraenkel (G.). **A Hormone causing Pupation in the Blowfly *Calliphora erythrocephala*.**—*Proc. roy. Soc.* (B) **118** no. 807 pp. 1–12, 1 pl., 1 fig., 17 refs. London, July 1935.

Liu (C. Y.). **A new Chinese Flea** [*Ceratophyllus* (*Oropsylla*) *sinensis*, sp. n.].—*Peking nat. Hist. Bull.* **9** pt. 4 pp. 273–275, 4 figs. Peking, June 1935.

Hsu (Yin-ch'i). **Two new Species of Insect Parasites** [*Ischnopsyllus needhami*, sp. n., and *Listropodia wui*, sp. n.] **of the Bat in Soochow.** —*Peking nat. Hist. Bull.* **9** pt. 4 pp. 293–298, 1 pl., 4 refs. Peking, June 1935.

Britten (H.). **Parasites** [including *Ceratophyllus gallinae*, Schr., and *Dermanyssus gallinae*, DeG.] **of Swallows and Animals found in their Nests.**—*Brit. Birds* **29** no. 1 pp. 16–18, 1 ref. London, 1st June 1935.

BUCKELL (E. R.). **Notes on Ticks and Insect Parasites of Game Animals in British Columbia.**—*Proc. ent. Soc. B.C.* no. 31 pp. 10–16. Victoria, B.C. [1935.]

In May 1932 in the Shuswap mountains, British Columbia, large numbers of larvae of *Cephenomyia trompe*, Modeer (*nasalis*, auct.), were taken from the throat and gullet of a mountain caribou (*Rangifer montanus*), and numerous examples of *Trichodectes tibialis*, Piaget, and one nymphal tick, probably *Dermacentor albipictus*, Pack., were collected from the hide of a mule deer (*Odocoileus hemionus*).

GREGSON (J. D.). **A Preliminary Report of the Lizard-Tick Relationship on the Coast of British Columbia.**—*Proc. ent. Soc. B. C.* no. 31 pp. 17–21. Victoria, B.C. [1935.]

From an investigation in 1933–34, it appears that *Ixodes ricinus californicus*, Banks, is distributed over the whole of the southern part of Vancouver Island and of the mainland coast. Reports indicate that cases of this tick attacking man occur mainly from February to June. A dozen adult ticks were taken when drags were made over dry grass in February 1934 in a locality where lizards (*Gerrhonotus multicarinatus*) were numerous, and information obtained from the inhabitants revealed that cases of tick bite occur at this time of year and that dogs frequently become so badly infested that the ticks have to be removed every day. Examination of lizards, chiefly in October, revealed larvae and nymphs [*cf. R.A.E.*, B **22** 162] in small numbers but no adult ticks. The number of adult ticks and lizards in the same area suggested that the percentage of parasitism would be higher earlier in the year, particularly as there are few other animals that would serve as hosts [*cf. loc. cit.*].

SPENCER (G. J.). **The Bed-bugs of British Columbia.**—*Proc. ent. Soc. B.C.* no. 31 pp. 43–45, 2 refs. Victoria, B.C. [1935.]

Notes are given on *Cimex lectularius*, L., which appears to be sparsely but widely distributed over British Columbia, *C. hemiptera*, F., which has not yet been recorded from the Province, *C. pilosellus*, Horv., which was taken from several species of bats and from their roosting places but does not appear to attack man, and *Oeciacus vicarius*, Horv., which is widely distributed in swallows' nests [*cf. R.A.E.*, B **18** 122], where all stages have been found.

DE TOLEDO PIZA (J.). **Importance de la tique dans la dissémination du typhus exanthématique de São Paulo.**—*C. R. Soc. Biol.* **119** no. 22 pp. 751–753, 1 ref. Paris, 1935.

The author gives reasons for considering that ticks are the most probable vectors of exanthematic typhus of São Paulo [*cf. R.A.E.*, B **21** 68]. In the first place, body lice [*Pediculus humanus*, L.] were absent and head lice (*P. capitis*, DeG.) not very abundant on patients in the isolation hospital. Moreover, the disease is epidemic in definitely rural areas where the population is scattered, it has not spread to towns or been to any great extent associated with particular families or neighbourhoods, and it is most prevalent in summer from October to January. As most of the patients had inhabited localities infested with ticks and were accustomed to their bites, it was difficult to

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establish a connection between tick bites and the infection. Cases are however, recorded in which a woman bitten by a tick became infected with the disease 4 days later (an incubation period similar to that produced experimentally in guineapigs) and a young girl developed the first symptoms on the day following a tick bite. In September 1933, L. Salles Gomes demonstrated by inoculations into guineapigs the existence of infected ticks (*Amblyomma ovale*, Koch) in nature. J. R. Meyer and J. Saboride succeeded in infecting guineapigs by inoculating them with head lice taken from patients suffering from the disease, but nurses in hospitals have not contracted it after becoming infested with lice from patients.

Roberts (J. I.) & Dick (D. A.). **Notes on the Control of Bed-bugs** (*Cimex rotundatus*).—*E. Afr. med. J.* **11** no. 2 pp. 48–57. Nairobi, May 1935.

The investigations described were undertaken with a view to discovering a practical means of controlling *Cimex hemiptera*, F. (*rotundatus*, Sign.) in the different types of premises in Kenya. In the houses of natives and Asiatics, the bugs were most prevalent in the beds and on the walls at heights of more than 4 feet. Several instances of infestations in European houses are described. Experiments with sprays applied with hand sprayers indicated that the liquid did not sufficiently penetrate the cracks of the tongued and grooved framework of beds, or of the tongued and grooved boards of walls and ceilings, nail holes, etc., to ensure the destruction of the bugs unless the sprayer was placed close to the holes and strong jets directed into them ; this was almost impossible at the higher levels. The procedure that has been found most effective is the removal of all woodwork, such as picture rails, ceiling boards, etc., the treatment of this woodwork and of the walls, window frames, etc., with a blow lamp, and the fumigation of the house for four hours with hydrocyanic acid gas. Fumigation alone cannot be relied on because a large amount of the gas escapes through the roof and other apertures, owing to the type of ventilation adopted in the construction of houses in the tropics, but it is of value for destroying bugs in furniture, bedding, etc., which cannot be treated with a blow lamp. For this reason all such articles should, where possible, be placed in one room and covered with a carpet or tarpaulin to form a canopy under which a certain amount of the fumigant is placed. The dosage of HCN used in this case is larger than usual so that the eggs may be killed and a second fumigation rendered unnecessary. If no sign of infestation is observed during the following few days, the woodwork is again treated with a blow lamp and replaced. Cleanliness is the only sure preventive of infestation, and the use of blow lamps and sprays should be supplemented by the routine use of soap and water.

Clark (N.). **The Effect of Temperature and Humidity upon the Eggs of the Bug,** *Rhodnius prolixus* (**Heteroptera, Reduviidae**).—*J. Anim. Ecol.* **4** no. 1 pp. 82–87, 11 refs. Cambridge, May 1935.

The experiments described were undertaken to test the effect of temperatures ranging from 15 to 35°C. [59–95°F.] and relative humidities ranging from 5 to 100 per cent. on the eggs of *Rhodnius prolixus*, Stål. Temperature was the dominant factor in determining the duration of the egg stage, which was 12 days at 34°C. [93·2°F.],

10 days at 33°C. [91·4°F.] and as long as 40 days at 17°C. [62·6°F.]. The only effect of humidity appeared to be a lag of 12–24 hours at all temperatures when the air was saturated. No eggs hatched at temperatures higher than 34°C. At 35 and 36°C. [96·8°F.] and relative humidities greater than 70 per cent., the embryos developed completely, a fact suggesting that the upper temperature limit is determined by some effect of heat upon the chorion rather than on the embryo. The lower vital limit was not determined with complete accuracy owing to the difficulty of maintaining the necessary temperatures constant for 5–6 weeks. At 12°C. [53·6°F.] no development could be detected; at 15°C. (possibly falling to 13°C. [55·4°F.]) no hatching occurred; at 16°C. [60·8°F.] (possibly rising to 17–18°C. [62·6–64·4°F.]) some hatching took place, and at 17°C., over a wide range of humidities, a comparatively high percentage of the eggs hatched. Thus the lower vital limit lies between 13 and 16°C. and is dependent on cessation of development in the embryo and not on the physical condition of the chorion. Between 17 and 33°C. humidity becomes the factor deciding the percentage hatch; a high percentage was obtained at any temperature provided that the relative humidity lay between 70 and 90 per cent. Complete saturation brought about a considerable mortality among the eggs. As a rule a decrease in relative humidity causes a decrease in the percentage hatch, the extent of which is dependent on the temperature. This decrease appears in all cases to be a physical effect on the chorion, as the embryo within is completely developed.

KABURAKI (T.). **Effect of some Exotic Plants and Animals upon the Flora and Fauna of Japan.**—*Proc. 5th Pacif. Sci. Congr. Canada 1933* **1** pp. 801–805, 3 refs., 1 diagr. Toronto, 1934. [Recd. May 1935.]

It is recorded that *Melophagus ovinus*, L., is very troublesome on sheep in Japan; it was undoubtedly introduced with its host.

NATTAN-LARRIER (L.) & DUFOUR (J.). **Affinités entre le trypanosome du hamster, les leptomonas des végétaux et les flagellés des insectes.**—*C. R. Soc. Biol.* **119** no. 20 pp. 494–496, 3 refs. Paris, 1935.

The author points out the similarity between forms of *Trypanosoma rabinowitchi* obtained in cultures on N.N.N. medium and of flagellates of plants and suggests that on this medium the hamster trypanosome undergoes a regressive change and tends to revert to the ancestral type of plant flagellates, the Herpetomonads of the digestive tract of insects, which are transmitted directly and are not adapted to the blood of vertebrates.

DAVIS (G. E.). **Tularaemia. Susceptibility of the White-tailed Prairie Dog,** *Cynomys leucurus* **Merriam.**—*Publ. Hlth Rep.* **50** no. 22 pp. 731–732. Washington, D.C., 31st May 1935.

During May 1933, 7 prairie dogs (*Cynomys leucurus*) infested with *Linognathoides* (*Neohaematopinus*) *laeviusculus*, Grube, were caught in north-western Colorado. They were given an injection of a suspension of *Bacterium tularense* and placed in cloth bags; all died in 6–8 days showing gross lesions suggestive or typical of acute tularaemia. A pure culture of *B. tularense* was isolated from the heart blood of one animal

shortly before death. A suspension of 6 lice taken from the bags in which the infected prairie dogs had been kept was injected intraperitoneally into a guineapig, which died of tularaemia 5 days later.

HERMS (W. B.), BAILEY (S. F.) & MCIVOR (B.). **The Black Widow Spider.**—*Bull. Calif. agric. Exp. Sta.* no. 591, 30 pp., 14 figs., 24 refs. Berkeley, Calif., June 1935.

The increase in the number of reported cases of bites by the poisonous Theridiid, *Latrodectus mactans*, F., is thought to be due to more accurate diagnosis and to the gradual adapatation of the spider to living in shelters erected by man.

Notes are given on its distribution, morphology and bionomics, and the nature of its venom, its effect on laboratory animals and man, and the treatment of bites in the latter are discussed. Owing to its wide distribution, solitary habits and varied habitat, it is difficult to control. It almost invariably recovers from the effects of fly sprays but is killed when sprayed directly with creosote, which also acts as a repellent. Only three natural enemies are known, *viz.*, the Scelionid, *Baeus latrodecti*, Dozier, which was taken in Haiti [*cf. R.A.E.*, B **19** 112] and is a true egg parasite (a single larva killing a single egg), and a Chloropid and a species of *Gelis*, which were observed in California feeding on the eggs in the egg-sac and destroying complete broods.

BACKLUND (H. O.). **A Contribution to the Knowledge of the Poultry-Lice in Finland.**—*Memor. Soc. Fauna Flor. fenn.* **10** pp. 42–46, 12 refs. Helsinki, 1935.

The lice found on fowls in Finland were, in order of decreasing abundance, *Menopon gallinae*, L. (*pallidum*, Nitz.), *Goniocotes gallinae*, Retz. (*hologaster*, Nitz.) and *Eomenacanthus stramineus*, Nitz. (*M. biseriatum*, Piag.). *Goniodes dissimilis*, Nitz., was found on two farms only.

Goniodes meleagridis, L., was found on all turkeys examined, and *E. stramineus* was commoner on turkeys than on fowls.

JETTMAR (H. M.). **Küchenschaben als Krankheitsüberträger.** [Cockroaches as Vectors of Disease.]—*Wien. klin. Wschr.* 1935 no. 20 reprint 14 pp., 3 figs., 9 refs. Vienna, 1935.

Few papers have been published on the part played by cockroaches in disseminating disease. After referring to Toda's investigation on *Blattella* (*Phyllodromia*) *germanica*, L., as a possible vector of cholera vibrios [*R.A.E.*, B **11** 204], the author records his own observations. In Manchuria and Transbaikalia, *B. germanica* was exceedingly common and overran the bodies of men who had died of plague, feeding on the infected secretions. In experiments, examples of this cockroach lived and reproduced for over a month, during which they were fed exclusively on plague-infected material. Their excreta contained the bacilli in a weakened form, usually incapable of infecting guineapigs by inoculation. After prolonged feeding on infected material, the cockroaches developed in the intestine an active bacteriophage against the bacilli of plague and Asiatic cholera. In view of the occurrence of *B. germanica* and *Blatta* (*Periplaneta*) *orientalis*, L., in a hospital, a number of experiments, here described briefly, were

made to test the flora of their intestinal contents. It was found that infected cockroaches were able to carry viable, pathogenic streptococci, and that for weeks after the infective feed the excreta contained these organisms in a viable and highly virulent condition. Cockroaches should therefore be kept away from all places where perfect asepsis is necessary. Soiled bandages, etc., should be at once immersed in disinfectant and not stored in pails until burned. As cockroaches are never found in cold storage chambers, bodies and organs can be safely kept there.

HU (S. M. K.). **Studies on the Susceptibility of Shanghai Mosquitoes to Experimental Infection with** *Wuchereria bancrofti* **Cobbold. I.**—*Aëdes albopictus* **Skuse. II.**—*Armigeres obturbans* **Walker.**—*Peking nat. Hist. Bull.* **9** pt. 4 pp. 249–260, 18 refs. Peiping, June 1935.

In these experiments carried out in Shanghai during 1933–34, reared adults of *Aëdes albopictus*, Skuse, and *Armigeres obturbans*, Wlk., were allowed to feed once for one hour on a person heavily infected with *Filaria* (*Wuchereria*) *bancrofti* and were dissected not less than 5 and usually more than 10 days later.

The following is taken from the author's summaries: Of 62 *A. albopictus* fed, 48 contained dead immature forms in the thorax and abdomen, 4 of which had undergone chitinous encapsulation. Of 102 *A. obturbans*, 81 contained dead microfilariae in the thorax and abdomen, most of which were chitinised; 11 contained chitinised encapsulated larvae of the "sausage" form. Filarial larvae developed to the infective stage in *Culex pipiens*, L., fed at the same time on the same case. Dissections of 383 examples of *A. obturbans* and 27 of *Aëdes albopictus* collected during 1933 from houses in the Woosung area revealed no filariae, although examples of *C. pipiens* from some of the houses were infected.

DE JESUS (Z.). **The Repellent and Killing Effects of Gordura Grass on the Larvae of the Cattle Tick** *Boöphilus australis*.—*Philipp. J. Anim. Ind.* **1** no. 4 pp. 193–207, 2 pls., 2 figs., 5 refs. Manila, 1934. [Recd. July 1935.]

A detailed account is given of experiments carried out in the Philippines to determine the repellent and lethal properties of gordura grass (*Melinis minutiflora*) for *Boophilus annulatus microplus*, Can. (*australis*, Fuller) [*cf. R.A.E.*, B **10** 169; **13** 2].

The following is taken from the author's summary and conclusion: The smell of gordura grass has a distinctly repellent effect on the larvae of the tick but by itself is not sufficient to prevent them from climbing the grass. In no case were they killed, even after prolonged exposure to the smell under both natural and artificial conditions. On the other hand, when they were allowed to climb the grass, they died in 40–60 days on the blades and 15–30 on the leaf sheaths, the difference in time being apparently due to the larger number of oil-secreting glandular hairs on the latter. Death appears to be caused either by exhaustion during the attempts of the ticks to free their legs, which become stuck by the oil to the hairs on the leaves, or by asphyxia, since their breathing pores become blocked by the oil that collects on their bodies as they move about among the hairs.

Thus it would appear possible to produce a tick-free pasture by planting nothing but gordura grass and allowing 90 days to elapse after the grazing of infested cattle, for in the Philippines all the eggs have hatched 15–30 days after the gravid female tick drops to the ground, and all the larvae die on the gordura grass in 40–60 days. Besides being a source of succulent and nutritious grass [but *cf.* **13** 2] gordura can be used as a tick-free pasture in the rotation of pastures for the control of the tick. Both experimentally and in nature mosquitos and possibly other small insects are caught on the oily hairs, but larger insects, such as ants and Tabanids, do not appear to be affected.

DE BUCK (A.) & SWELLENGREBEL (N. H.). **The Salivary Glands in hibernating** *Anopheles maculipennis* **var.** *messeae* **and semi-hibernating** *Anopheles maculipennis* **var.** *atroparvus*.—*Proc. Acad. Sci. Amst.* **38** no. 4 pp. 452–454, 1 pl., 8 refs. Amsterdam, April 1935.

On the dissection of large numbers of *Anopheles* from attics used as bedrooms in villages north of Amsterdam, the authors found rod-shaped salivary glands in most of the hibernating individuals of *A. maculipennis messeae*, Flni. They consider that this character makes it possible to identify *messeae* in attics where it occurs with *atroparvus*, van Thiel, and to ascertain that both varieties behave differently, the former taking blood and the latter fasting, environmental conditions being the same for both.

DE BUCK (A.) & SWELLENGREBEL (N. H.). **Further Studies on, and Discussion of the Results of crossmating the Races (Varieties) of** *Anopheles maculipennis*.—*Proc. Acad. Sci. Amst.* **38** no. 5 pp. 553–558, 1 pl., 5 refs. Amsterdam, May 1935.

In view of the importance of the results of crossing *Anopheles maculipennis* var. *atroparvus*, van Thiel, with other races of the species [*R.A.E.*, B **22** 198], the authors repeated some of the experiments in Amsterdam with a complete change of animal material. The experiments were limited to the varieties known in Holland, *atroparvus*, *messeae*, Flni., and typical *maculipennis*, Mg. The mosquitos were collected in Sweden and Finland. The response to hybridisation was exactly the same as in the case of material collected in Holland and Italy [*loc. cit.*]. This similarity proves that these races in Italy, Sweden and Holland are genetically as well as morphologically identical, apart from the possibility of their including a number of sub-races at present indistinguishable. The geographical distribution of these genetical entities, from mid-Italy to northern Sweden, is strong evidence against the conception that the varieties are really biotypes called into existence by the influence of human life.

LEGENDRE (J.). **Le moustique maritime.**—*C. R. Acad. Sci. Fr.* **201** no. 1 pp. 96–98, 1 ref. Paris, 1935.

The mosquito, *Aëdes caspius*, Pall. (*punctatus*, Mg.), which occurs in the coastal salt marshes of Charente, apparently hibernates in the adult stage, as the heavy rains of November destroy the larvae. The eggs are laid before the end of winter after the first high tide has receded and left stagnant pools. The larvae are sensitive to cold.

Some that were kept at 3°C. [37·4°F.] seemed to be dead, but became active after being exposed to the sun or transferred to a room at 13°C. [55·4°F.]. Two samples of water in which larvae occurred contained 26 gm. sodium chloride per litre, but the author found others in large numbers in a ditch that had only 1·053 gm. per litre. Fresh oviposition took place in pools left by a second high tide on 3rd April, after the pools left by the previous tide had dried up, and young larvae were seen with the older larvae and pupae that had survived desiccation. Adults appeared 3 weeks after each tide. Since the next high tide is not due till 16th July, the fertilised females of the April generation must wait 2½ months before ovipositing.

ALESSANDRINI (G.). **Anofelismo senza malaria.**—*Acta pontif. Acad. Sci.* **88** pp. 232–241, 2 figs. Rome, 1935.

In the intensely cultivated rice-fields around Vercelli Anophelines are numerous enough to cause great annoyance to man and animals, but malaria has never appeared in the district, though it is rife in some typical marshes of the Pontine region, where there is an equal water area and an equal abundance of Anophelines. An examination of the stomach-contents of over 3,000 larvae showed that larvae from the rice-fields contained diatomeae and green algae. Their stomachs, being stout-walled with normal cellular layers, were easily dissected out. Larvae from the marshes contained decomposed vegetable débris and earth with only traces of chlorophyll vegetation and their stomachs, being thin-walled with worn cells, were easily torn on removal. Larvae from rice-fields were large and green, while those from the marshes were smaller and brown.

At Novara, Frongia has never succeeded in infecting newly-emerged Anophelines from rice-fields by causing them to feed on malaria cases that had numerous gametocytes. It is concluded that the favourable conditions of their larval habitat cause Anophelines in rice-fields to acquire a temporary or permanent resistance to malarial infection.

MORISHITA (K.). **On** *Anopheles* (*Myzomyia*) *indefinitus* **(Ludlow, 1904) in Formosa. Adjustment of** *A. formosensis* **II,** *A. rossii* **and** *A. vagus* **Problem.** [*In Japanese.*]—*J. med. Ass. Formosa* **34** pt. 5 (no. 362) pp. 558–578. Taihoku, Formosa, May 1935. (With a Summary in English.)

In 1902 Tsuzuki described an Anopheline from Formosa under the name of *Anopheles formosaensis* II, about the systematic position of which there has been much discussion. A detailed study of its adults and larvae and a comparison with the related forms leads the author to conclude that it is not a synonym of *A. vagus*, Dön., but is identical with *A. indefinitus*, Ludl., which is considered specifically distinct from *A. subpictus*, Grassi [*cf. R.A.E.*, B **20** 93]. The species occurs in the southern half of Formosa and in the Pescadores Islands (Hokoto).

WILSON (T.). **Meteorological Factors as affecting the Incidence of Malaria.**—*Malay. med. J.* **10** no. 2 pp. 39–48, 1 map, 5 charts, 15 refs. Singapore, June 1935.

In this paper an attempt is made to correlate the incidence of malaria with climatic factors by comparing the figures for hospital admissions from two districts in Negri Sembilan for the years 1929–33

with meteorological data obtained locally for the same period. The chief vector of malaria in this region appears to be *Anopheles maculatus*, Theo. Malaria is most prevalent during May, June and July, with an inconstant smaller secondary rise towards the end of the year. The heaviest rainfall and the greater number of wet days occur in October–November, but there is also a wet season with a somewhat lower rainfall in March–May. Although an increase in the number of breeding places following rains in the latter season might account for the rise in malaria in May–July, no such marked rise occurs after the prolonged rainfall in October–December, so that factors other than rainfall must be concerned. From the literature it appears that the larval incidence of *A. maculatus* is greatest in February–April shortly after the main wet season, adult incidence is greatest during March–May, and malaria due to this mosquito is most prevalent in April–July. An annual rise in the mean wet bulb temperature takes place mainly between March and June and an annual fall between November and February, beginning at the period when the rainfall is usually at its maximum. Thus the author suggests that malaria may be related to an increase in the activity of the adult Anopheline, particularly with regard to " blood-hunger," during the period of high wet bulb temperature and a decrease during the period when it is low.

LINDQUIST (A. W.). **Notes on the Habits of certain Coprophagous Beetles and Methods of rearing them.**—*Circ. U.S. Dep. Agric.* no. 351, 9 pp., 2 figs., 4 refs. Washington, D.C., May 1935.

Dung beetles not only have a beneficial effect on the soil [*cf. R.A.E.*, A **21** 665] but by disturbing the cattle dung in which *Lyperosia* (*Haematobia*) *irritans*, L., breeds they probably reduce the abundance of this pest of cattle. Many species act as intermediate hosts for parasites of poultry and other animals [*cf.* B **19** 183, etc.]. In view of their economic importance, observations were made in Texas, in the course of the years 1931–34, on the methods by which they can be reared and on their habits. In the present paper the bionomics of *Copris remotus*, Lec., *Phanaeus triangularis*, Say, *Canthon laevis*, Drury, and *Onthophagus anthracinus*, Har., are dealt with in some detail, and brief notes are given on *Canthon lecontei*, Har., *C. cyanellus*, Lec., *Onthophagus pennsylvanicus*, Har., *Pinotus carolinus* var. *colonicus*, Say, *Aphodius* spp., including *A. lividus*, Ol., and *Ataenius* spp. In south-western Texas several of these species, particularly *Canthon laevis*, are commonly found in the bait pans of blowfly traps. They are probably attracted by the odour of the meat, which may serve as food for the adults, but is not necessary in rearing them in the laboratory. In this region the species chiefly responsible for the dispersal of dung are *C. laevis*, *Phanaeus triangularis* and *Pinotus carolinus* var. *colonicus*.

COVELL (G.), BAILY (J. D.) & PRASAD (Vidya). **An Experiment with Paris Green in a Hyperendemic Village in Sind.**—*Rec. Malar. Surv. India* **5** no. 2 pp. 131–152, 11 refs. Calcutta, June 1935.

A detailed account is given of an experiment carried out from 1930–33 to determine whether the incidence of malaria in a village

in a hyperendemic rice-growing area of the Larkana District of Sind could be controlled, or at least mitigated, by the application of Paris green to Anopheline breeding places within a limited area and for a limited period each year. Previous observations had shown that the only malaria vector of importance in the district was *Anopheles culicifacies*, Giles, and that the malaria season lasted from September to December [*cf.* *R.A.E.*, B **19** 75]. The Paris green was applied to breeding places within 500 yards of the periphery of the village at the rate of approximately 1 lb. per acre of water surface at intervals of 5–7 days from 1st August to the end of October and of 7–9 days from 1st November to 31st December. When the poison was applied by hand, it was mixed with road dust, but when blowers were used, it was diluted with soapstone or slaked lime. The most satisfactory proportions were found to be 1 and 2½ per cent. by volume respectively.

An analysis of the results of observations made in this village and in an untreated village in the same district showed that although the anti-larval measures were to a certain extent successful in reducing the incidence of malaria during the first two years, they were inadequate during 1932–33 owing to the change in breeding conditions brought about by the operation of the Lloyd Barrage scheme and the unusually high rainfall of 1933. Paris green is an unsuitable larvicide for use on moving water, at least under conditions of canal irrigation. The employment of oil balls [*cf.* **23** 194] tethered along the margins of the canal would probably have been much more effective in killing the larvae that were constantly being washed into the treated area. The authors consider that anti-larval measures are unlikely to meet with any great success under hyperendemic conditions in rural areas of Sind, because the Anopheline density necessary to maintain a high rate of malaria infection is so low; in the present experiment, even though the numbers of *A. culicifacies* were reduced by 80 per cent., the number of infections was sufficient to produce a spleen rate of over 80 per cent. in the autumn of 1931. Opinions as to the difficulties of the control of rural malaria and the cost of anti-larval measures are quoted from the literature. The only practical possibility of success would appear to lie in the establishment of anti-malaria units in towns and the gradual extension of their work to villages in the immediate neighbourhood, so that the cost of skilled supervision could be shared.

COVELL (G.). **The Effect of Paris Green Dusting on Rice Crops.**—*Rec. Malar. Surv. India* **5** no. 2 pp. 153–157. Calcutta, June 1935.

In view of the fact that complaints have been received from growers that dusting with Paris green for the control of Anopheline larvae causes damage to crops, particularly rice, malariologists in India and other countries were asked to give their opinions, and in this paper the author quotes from their letters and gives extracts from the literature bearing on the question. The evidence thus collected indicates that in the quantities used in anti-larval work this larvicide exerts no harmful effect on the crop. As, however, some damage may be caused by the application of the dust to the open flowers of rice, it is recommended that during the flowering season dusting should be carried out in the afternoon when the rice-flowers are closed.

Sen (P.). **Observations on the Emergence of Anophelines.**—*Rec. Malar. Surv. India* **5** no. 2 pp. 159–171, 6 charts, 11 refs. Calcutta, June 1935.

The fact that adult Anophelines were frequently found to be scarce in localities where the larvae were numerous led the author to undertake detailed observations on pupation and emergence with a view to explaining this phenomenon. A large number of the species of mosquitos that occur in the delta region of Bengal were studied, including *Anopheles varuna*, Iyen., *A. annularis*, Wulp, *A. hyrcanus* var. *nigerrimus*, Giles, *A. barbirostris*, Wulp, *A. vagus*, Dön., *A. subpictus*, Grassi, *A. stephensi*, List., *A. sundaicus*, Rdnw., *A. philippinensis*, Ludl., *A. culicifacies*, Giles, *A. aconitus*, Dön., *A. ramsayi*, Covell, *Culex fatigans*, Wied., and *Aëdes aegypti*, L. As far as possible the larvae were reared in water from their natural breeding places and fed on *Spirogyra*.

The following is taken from the author's summary: Pupation takes place more often during the day than at night. The duration of the pupal period, which varied in the different species, depends on season and temperature and ranged from 26 hours in summer to 48 in winter. The process of emergence, which is described, occupies about 8–10 minutes and in most cases reaches its peak between the hours of 6 and 9 p.m. The average rate of mortality among emerging adults in the laboratory was 22 per cent. Pupae succumb to extremes of temperature and are also preyed on by natural enemies, such as ants. Malformation of the locomotory organs also causes death in some cases. When the sum total of all emergences is considered, the sexes occur in the proportion of 2 males to 3 females, but when broods belonging to certain species are dealt with separately, the proportions may be equal or in some cases the males may predominate [*cf. R.A.E.*, B **22** 142]. It is possible that climatic conditions may influence the ratio, since, in some species at least, males predominate in dry weather.

Kazeeff (W. N.). **La lutte contre la fièvre jaune.**—*La Nature* **62** no. 2 pp. 556–560, 2 maps, 4 figs.; **63** no. 1 pp. 23–27, 12 figs. Paris, 1934–35.

This account of yellow fever and of measures against it includes historical notes, a description of the fever, and notes on the bionomics of the vector, *Aëdes* (*Stegomyia*) *aegypti*, L., on the investigations into the transport of the mosquito by aeroplanes, and on work connected with the control of the vector and the prevention and cure of the disease. One sketch map shows the foci of yellow fever in French West Africa and another the world distribution of the fever and of the mosquito within the isotherms 20°C. [68°F.].

Schilling (C.). **Schutzimpfung gegen Tsetse- und Schlafkrankheit.** [Protective Inoculation against Tsetse Disease and Sleeping Sickness.]—*Tropenpflanzer* **38** no. 6 pp. 229–238. Berlin, June 1935.

Immunisation experiments begun in Berlin [*R.A.E.*, B **22** 13] were continued by the author at Tinde, Tanganyika in 1933 and 1934. Calves were inoculated with a vaccine prepared from the dried blood of rats infected with *Trypanosoma congolense* and *T. brucei*. The experiments

showed that while about 40 per cent. of the calves possessed a certain degree of natural resistance to trypanosomiasis, this percentage could be raised considerably by inoculation, which conferred increased resistance to bites by infected examples of *Glossina morsitans*, Westw., and *G. swynnertoni*, Aust.

HU (S. M. K.). **Notes on the relative Adult Density of** *Anopheles hyrcanus* **var.** *sinensis* **Wiedemann during 1933 with Reference to Malaria Incidence in Kaochiao, Shanghai Area.**—*Chin. med. J.* **49** no. 5 pp. 469–474, 1 graph, 3 refs. Peiping, May 1935.

A study of the adult density of *Anopheles hyrcanus* var. *sinensis*, Wied., the only species of Anopheline found in the Shanghai area [*cf. R.A.E.*, B **22** 178], was carried out in 1933. A man-baited trap, consisting of a one-roomed dwelling, was situated in the courtyard of a group of farm-houses, so that the catches might be representative of the inhabited houses of the surrounding villages. These are set in the midst of rice-fields and surrounded by irrigation creeks, both of which constitute Anopheline breeding places. Previous observations having shown that *A. hyrcanus* var. *sinensis* invades dwellings at night, the collector entered the trap at 7 p.m. and catches were made at 8 and 9 p.m. and at 6 a.m. for 6 days a week during 28 weeks from 22nd May. The average daily density was calculated for each week. It rose from 2·5 in the first week to its first peak (23·25) in the fourth, and reached its maximum (34·15) in the first week of July. There was a third peak (22) in the middle of August, after which the average density fell gradually to zero by the middle of October. The percentage of malarial cases in the same area appear to be correlated with Anopheline density, the malaria curve showing a month's lag, which may be explained by the extrinsic and intrinsic incubation periods of the malaria parasite.

HU (S. M. K.). **Preliminary Observations on the Longevity of infective Larvae of** *Wuchereria bancrofti* **Cobbold in** *Culex pipiens* **var.** *pallens* **Coquillett.**—*Chin. med. J.* **49** no. 6 pp. 529–536, 9 refs. Peiping, June 1935.

In a further experiment [*cf. R.A.E.*, B **22** 104], 22 females of *Culex pipiens* var. *pallens*, Coq., from the Shanghai area that had fed on 10th September 1934 on a patient infected with *Filaria* (*Wuchereria*) *bancrofti* were maintained on a diet of raisins soaked in water and dissected at intervals between the 10th and the 93rd day after the blood meal. On the 10th day the microfilariae were still immature, on the 12th day fully developed larvae were found in the abdomen and immature larvae in the thorax, whereas only mature larvae were present on the 14th day. Thus the incubation period at this time of year would appear to be about 14 days [*cf.* **23** 148]. For the first 14 days and the following 79 days the average mean room temperatures were 76·2 and 66°F. and the relative humidities 77·9 and 74·7 per cent., respectively. In the single mosquito dissected on the 93rd day two viable infective larvae were found in the abdomen. Only three mosquitos contained no microfilariae, and of the two that contained dead examples, one also contained living parasites. The significance of the longevity of infective filarial larvae as a factor in the epidemiology of filariasis is discussed.

Edwards (F. W.). **Mosquito Notes.—XII.**—*Bull. ent. Res.* **26** pt. 2 pp. 127–136. London, June 1935.

This paper deals with new records from Fiji and Hong Kong, new species of *Aëdes* (*Finlaya*) from China and Madagascar, the occurrence of *Aëdes caballus*, Theo., in Persia, and some new African Culicines. The only Anopheline mentioned is *Anopheles fluviatilis*, James, which was collected in Hong Kong. This species has not hitherto been found east of Tonkin.

Tonnoir (A. L.). **The Australian Species of the Genus** *Phlebotomus*.—*Bull. ent. Res.* **26** pt. 2 pp. 137–147, 1 pl., 3 figs., 7 refs. London, June 1935.

Descriptions are given of *Phlebotomus queenslandi*, Hill, which has not been found since it was first described from Queensland [*R.A.E.*, B **11** 157], *P. queenslandi meridionalis*, subsp. n., and *P. englishi*, sp. n., from New South Wales, and *P. brevifilis*, sp. n., from New South Wales and Canberra, together with a key to the adults of both sexes. *P. brevifilis* fed on man, but neither *P. queenslandi meridionalis* nor *P. englishi* could be induced to do so. All three species fed readily on lizards. The author discusses certain taxonomic characters of the genus *Phlebotomus* and their terminology. For the male terminalia he considers that the terminology suggested in a paper by Christophers and Barraud [**14** 142] is both simple and satisfactory, except that the intromittent organ is in reality composed of the penis filaments and the penis sheath.

Bishopp (F. C.). **Mosquito Control Work of To-day.**—*J. econ. Ent.* **28** no. 3 pp. 620–627. Geneva, N.Y., June 1935.

In this general review of the control of mosquitos, the diseases of man and animals carried by them are briefly discussed, and the relation of mosquito control to other economic and social problems is indicated. The necessity for further research on mosquito problems is stressed, and some account is given of control work already effected throughout the world, and especially in the United States.

Laake (E. W.). **The Incidence of Screw Worms in southern Texas and Louisiana in 1934.**—*J. econ. Ent.* **28** no. 3 pp. 648–649. Geneva, N.Y., June 1935.

A survey in 1934 of the coast of the Gulf of Mexico showed that a serious outbreak of *Cochliomyia hominivorax*, Coq. (*americana*, C. & P.) [*cf. R.A.E.*, B **23** 11] and *C. macellaria*, F., in Louisiana and other south-eastern States [*cf.* **22** 101, etc.] was continuous with a heavy incidence of screw-worms along the Texas coast. Percentages of infestation for various classes of domestic animals are recorded from six counties in Texas. In Louisiana the outbreak spread over the southern half of the State and the eastern bank of the Mississippi River. For the principal classes of domestic animals in 7 parishes there were 83,431 cases of screw-worm in 791,817 animals. The loss in sheep was particularly heavy, but the percentage of mortality among cattle, horses, mules and pigs was not very high.

Culbertson (J. T.). **Antibody Production by the Rabbit against an Ectoparasite.**—*Proc. Soc. exp. Biol. Med.* **32** no. 8 pp. 1139–1140. New York, May 1935.

It has been found that repeated puncture of the skin of rabbits by large numbers of *Psoroptes cuniculi*, Delaf., leads to the production of a specific antibody for the mite.

Wheeler (C. M.), Herms (W. B.) & Meyer (K. F.). **A new Tick Vector of Relapsing Fever in California.**—*Proc. Soc. exp. Biol. Med.* **32** no. 8 pp. 1290–1292, 8 refs. New York, May 1935.

Ticks have been suspected for some time as vectors of relapsing fever in California but no positive experimental evidence for a particular species has been obtained until recently. In 1931, 1933 and 1934 numbers of a new species of *Ornithodorus*, here described as *O. hermsi*, were collected from various localities in California at elevations of 5,000–8,000 ft. where cases of relapsing fever had occurred. When these ticks were allowed to feed on a monkey (*Macacus*) and on white mice spirochaetes were found in the blood of all the animals. Brumpt considers that the spirochaete responsible for relapsing fever in Texas and probably California is *Spirochaeta turicatae* [*R.A.E.*, B **21** 243], but it has not yet been shown if *O. hermsi* can transmit the Texan spirochaete or if *O. turicatae*, Dug., is a vector of the Californian.

Schulze (P.). **Zur vergleichenden Anatomie der Zecken. (Das Sternale, die Mundwerkzeuge, Analfurchen und Analbeschilderung, ihre Bedeutung, Ursprünglichkeit und Luxurieren.)** [On the Comparative Anatomy of Ticks. (The Sternites, Mouth-parts, Anal Grooves and Anal Shield, their Significance, Origin and Development.)]—*Z. Morph. Oekol. Tiere* **30** no. 1 pp. 1–40, 37 figs., 47 refs. Berlin, 22nd May 1935.

This paper includes three new species of ticks and three new subgenera of the genus *Ixodes*.

Möschler (A.). **Beobachtungen über die Lebensweise und die Schädlichkeit der Elchrachenbremse,** *Cephenomyia ulrichii* **Brauer, auf der Kurischen Nehrung.** [Observations on the Life-history and Harmfulness of *C. ulrichi* in the Kurische Nehrung.]—*Z. Parasitenk.* **7** no. 5 pp. 572–578, 1 ref. Berlin, 20th June 1935.

In September 1906, and again in May–June of the years 1919–30, the author found larvae of *Cephenomyia ulrichi*, Brauer, in the nostrils of elk shot in East Prussia. Adults were collected between May and September. The larvae of the first instar took at least 8 months to develop, and the second and third instars together probably only 3 months. Since the fly appears in May, the elk probably harbour larvae of 2 generations from mid-June to mid-August. When fully grown, the mature larvae leave the host and soon pupate under twigs on the ground. The pupal stage occupied 3 weeks in a warm laboratory, but probably lasts longer in natural surroundings. If it is infested with large numbers of larvae, the host can feed and breathe only with difficulty. Control is difficult. Of the flies caught in traps 90 per cent. were males.

PIEKARSKI (G.). **Beiträge zur intracellulären Symbiose, Entwicklungsgeschichte und Anatomie blutsaugender Gamasiden.** [Contributions to intracellular Symbiosis, Development and Anatomy of blood-sucking Gamasids.]—*Z. Parasitenk.* **7** no. 5 pp. 615–634, 16 figs., 57 refs. Berlin, 20th June 1935.

Investigations showed that the snake mite, *Ophionyssus natricis*, Gerv., harbours intracellular symbionts, which are scattered in the egg (to which they have been transmitted from the mother) and larva, but become localised at the first moult during the formation of the gut. The fowl mite, *Dermanyssus gallinae*, DeG., harbours no symbionts.

NIESCHULZ (O.). **Ueber die Temperaturabhängigkeit der Aktivität und die Vorzugstemperatur von** *Musca domestica* **und** *Fannia canicularis.* [On the Dependence of Activity upon Temperature and the preferred Temperature in *M. domestica* and *F. canicularis.*]—*Zool. Anz.* **110** no. 9–10 pp. 225–233, 1 fig., 5 refs. Leipzig, 1st June 1935.

An account is given of experiments with *Musca domestica*, L., and *Fannia canicularis*, L., similar to those carried out with *Stomoxys calcitrans*, L. [*R.A.E.*, B **22** 217, etc.]. In *M. domestica* activity began at an average temperature of 6·7°C. [44°F.], and heat paralysis, which began at an average of 44·6°C. [112·2°F.], was complete at an average of 46·5°C. [115·7°F.]. The corresponding average temperatures for *F. canicularis* were 4·2°C. [40·1°F.], 39·1°C. [102·3°F.] and 40·9°C. [105·5°F.]. Optimum temperatures for *M. domestica* showed an average of 33·1°C. [91·6°F.] for females and 34·2°C. [93·6°F.] for males. The optimum for both sexes of *F. canicularis* was 23·7°C. [74·6°F.]. A comparison of these results with those for *S. calcitrans* shows that all three flies have typical optimum temperatures that are peculiar to the species.

ULLRICH (H.). **Ueber das Vorkommen der Rachenbremse beim Damwild** (*Cephenomyia multispinosa* **spec. nov.**). [On the Occurrence of the throat Bot-fly, *C. multispinosa*, sp. n., in Fallow Deer.]—*Zool. Anz.* **111** no. 1–2 pp. 43–45, 6 figs., 3 refs. Leipzig, 1st July 1935.

A description is given of the larva of *Cephenomyia multispinosa*, sp. n., obtained from the larynx of a fallow deer.

KEMPER (H.). **Bettwanzenbekämpfung.** [Bed-bug Control.]—*Z. GesundhTech. Städtehyg.* **27** no. 5 pp. 153–160, 2 figs. Berlin, May 1935.

This is a general account of the bionomics and control of *Cimex lectularius*, L. A number of proprietary fumigants are noticed.

SCHEDL (K. E.). **Fliegenbekämpfungsmittel. (Eine vergleichende Studie.)** [Insecticides against Flies. A comparative Study.]—*Anz. Schädlingsk.* **11** no. 6 pp. 68–70. Berlin, June 1935.

Tests are described in which a German proprietary fly-spray was compared with others of foreign origin, *Calandra granaria*, L., and *Musca domestica*, L., being used as the test insects.

METALNIKOV (S.) & MENG (L. G.). **La tuberculose chez les courtillières** (*Gryllotalpa vulgaris*).—*C. R. Soc. Biol.* **119** no. 25 pp. 1102–1103, 1 ref. Paris, July 1935.

Experiments in which tubercle bacilli both of man and of cattle were injected into *Gryllotalpa gryllotalpa*, L. (*vulgaris*, Latr.) have shown it to be immune.

LEGG (J.). **The Australian Cattle Tick** (*Boophilus microplus*): **The Time between Dipping and Removal of Cattle necessary to protect Free Areas.**—*J. Coun. sci. industr. Res. Aust.* **8** no. 2 pp. 133–136. Melbourne, May 1935.

In the experiments described cattle that had been dipped in sodium arsenite at the rate of 2 lb. As_2O_3 to 100 gals. were each artificially infested with at least 10,000 larvae of *Boophilus annulatus microplus*, Can. The larvae were applied in one case 36 hours and in two cases both 12 and 36 hours after dipping. In one of the latter experiments the treated animals were also sprayed with water for 5–10 minutes at intervals during the 36 hours after dipping to simulate exposure to showers of rain. From the numbers of mature females subsequently collected, it was estimated that there had been a mortality of more than 99 per cent. among ticks on the dipped cattle and of more than 93 per cent. on the dipped and sprayed cattle. Moreover, they laid fewer eggs, of which a smaller proportion was viable, than ticks from the control animals, which had been similarly infested but not treated in any way. The experimental infestation to which the cattle had been subjected was higher than would occur in nature, and it is considered that if treated cattle are kept in yards or driven along roads where the likelihood of infestation is low, the probability of their picking up, within 36 hours of dipping, larval ticks that would eventually develop into females capable of ovipositing is remote.

PAPERS NOTICED BY TITLE ONLY.

BAIGAR (F.). **Die Läuse unserer Haustiere.** [The Lice of our Domestic Animals (including keys).] [*In Czech.*]—*Biol. Spis. vys. Šk. Zvěrolék.* **13** no. 180 pp. 1–28, 8 pls., 13 refs. Brno, 1934. (With a Summary in German.) [Recd. June 1935.]

FOLCO (G. B.). **Osservazioni sullo sviluppo di** *Chrysozona* (*Haematopota*) *italica* **Meig.** [Observations on the Development of *H. italica* (morphology of the last larval instar and of the nymph).]—*Mem. Soc. tosc. Sci. nat.* **44** pp. 1–11, 1 pl., 4 figs., 13 refs. Pisa, 1934. [Recd. June 1935.]

VAN THIEL (P. H.). **Züchtungsversuche in Zusammenhang mit dem Rassenproblem bei** *Anopheles maculipennis*. [Breeding Experiments in Connection with the Problem of Races in *A. maculipennis*.]—*Acta leidensia* **8** pp. 242–266, 2 graphs, 22 refs. Leyden, 1933. [Recd. June 1935.] [*Cf. R.A.E.*, B **19** 143.]

VAN THIEL (P. H.). **Investigations on the Range and Differentiation of** *Anopheles maculipennis* **Races and their Bearing on the Existence or the Absence of Malaria in Italy.**—*Acta leidensia* **9** pp. 232–273, 2 pls., 8 graphs, 25 refs. Leyden, 1934. [Recd. June 1935.] [*Cf. R.A.E.*, B **21** 211.]

van Thiel (P. H.). **Recherches sur la présence de l'*Anopheles maculipennis* var. *labranchiae* dans les Pays-Bas.**—*Acta leidensia* **9** pp. 283–288, 5 refs. Leyden, 1934. [Recd. June 1935.] [*Cf. R.A.E.*, B **22** 81.]

van Thiel (P. H.). **Insuffisance des caractères de l'oeuf pour la distinction des races trophiques et biologiques de l'*Anopheles maculipennis*?**—*Acta leidensia* **9** pp. 289–293, 8 refs. Leyden, 1934. [Recd. June 1935.] [*Cf. R.A.E.*, B **22** 82.]

Sgonina (K.). **Die Reizphysiologie des Igelflohes (*Archaeopsylla erinacei* Bouché) und seiner Larve.** [The Physiology of Attraction of the Hedgehog Flea, *A. erinacei*, and its Larva.]—*Z. Parasitenk.* **7** no. 5 pp. 539–571, 12 figs., 23 refs. Berlin, 20th June 1935.

Ass (M. I.). **Zur Kenntnis der Ektoparasiten der Flossenfüssler (Pinnipedia). Eine neue Zeckenart auf dem Walross. (Vorläufige Mitteilung.)** [Contribution to the Knowledge of the Ectoparasites of Pinnipedia. A new Tick (*Dermacentor rosmari*) on the Walrus. (Preliminary Communication.)]—*Z. Parasitenk.* **7** no. 5 pp. 601–607, 5 figs., 12 refs. Berlin, 20th June 1935.

[Zasukhin (D. N.), Tiflov (V. E.) & Schul'tz (R. S.).] Sassuchin (D. N.), Tiflow (W. E.) & Schulz (R. S.). **Endo- und Ectoparasiten der Sandmaus, *Rhombomys opimus* Licht. 3. Mitteilung.** [Endo- and Ectoparasites (Fleas and Ticks) of the Jerboa, *R. opimus* (in the Russian Union). Communication iii.]—*Z. Parasitenk.* **7** no. 5 pp. 635–638, 45 refs. Berlin, 20th June 1935. [*Cf. R.A.E.*, B **23** 178.]

Thompson (G. B.). **The Parasites of British Birds and Mammals. IV. Records of Bat Parasites.**—*Ent. mon. Mag.* **71** nos. 853–854, pp. 143–147, 7 refs. London, June–July 1935.

Laing (J.). **On the Ptilinum of the Blow-fly (*Calliphora erythrocephala*).**—*Quart. J. micr. Sci.* N.S. **77** no. 4 pp. 497–521, 14 figs., 16 refs. London, June 1935.

Dyer (B. R.) & Landauer (E.). **On the Value of Sodium Cyanide in Fly Control.**—10 pp. Nanking, Central Field Hlth Sta. [1935.] [*Cf. R.A.E.*, B **23** 175.]

MacDougall (R. S.). **Ox Warble Flies** [a useful summary of data on *Hypoderma* spp. infesting cattle].—*Scot. J. Agric.* **18** no. 3 pp. 209–218, 2 pls., 3 figs., 2 refs. Edinburgh, July 1935.

Cuillé (J.), Chelle (—) & Berlureau (—). **Existence en France d'une anaplasmose bovine d'origine indigène.**—*C. R. Acad. Sci. Fr.* **200** no. 23 pp. 1994–1996. Paris, 1935.

Cuillé (J.), Chelle (—) & Berlureau (—). **Identité de l'anaplasmose bovine française et algérienne.**—*C. R. Acad. Sci. Fr.* **201** no. 2 pp. 179–180, 1 ref. Paris, 1935.

Harvey (D.). **Typhus Fevers** [a brief review of present knowledge on fevers of the typhus group].—*J. R. Army med. Cps* **65** no. 1 pp. 1–8. London, July 1935.

Akkerman (K.). **Researches on the Behaviour of some pathogenic Organisms in the intestinal Canal of *Periplaneta americana* with Reference to the possible epidemiological Importance of this Insect.**—*Acta leidensia* **8** pp. 80–120, 2 figs. Leyden, 1933. [Recd. June 1935.]

Experiments to ascertain whether cholera vibrios multiply in the gut of *Periplaneta americana*, L., showed that no vibrios could be isolated from the dissected oesophagus 24 hours after feeding. They were found in the stomach after 24 hours and in the hind-gut after 24, 48 and 72 hours. Examination of the faeces of 63 test insects revealed vibrios 24 hours after feeding in 8 cases, no vibrios after 48 hours, vibrios after 72 hours in 1 case, and no vibrios after 96 hours. In one case many cholera vibrios were found in a regurgitated drop.

In other experiments with typhoid bacilli the oesophagus contained bacilli after 24 and 48 hours. They were found in the stomach after 48, and in the hind-gut after 24, 48 and 72 hours, and they occurred in the faeces after 24, 48 and 72 hours, but not after 96 hours.

In experiments with the eggs of *Ancylostoma caninum* and *A. ceylanicum* the faeces of a dog infested with both worms were fed to *P. americana*. The collection of larvae in 5 out of 10 cultures from the faeces of the cockroach, proved the free passage of the eggs through the gut. Eggs were found in the crop, proventriculus, stomach, hind-gut and faeces of cockroaches, but not in the pharynx. In the most favourable case, 40·3 per cent. of the ingested eggs were found 20 minutes after feeding. After 24 hours the percentage fell to 16·4, but as larvae and eggs were found after 48 and 72 hours, it is concluded that a number of eggs remain in the intestine for some days.

van Thiel (P. H.). **Warum ist das Vorkommen von Malaria in Niederland auf einige Gegenden beschränkt ?** [Why is the Occurrence of Malaria in Holland confined to some Districts ?]—*Acta leidensia* **9** pp. 274–282, 17 refs. Leyden, 1934. (With a Summary in English.) [Recd. June 1935.]

The following is taken from the summary. The occurrence in Holland of Anophelism without malaria is attributed to the difference in hibernation between the large-winged and short-winged races of *Anopheles maculipennis*, Mg. [*cf.* R.A.E., B **18** 52], and to the difference in the density of Anopheline population. This last factor must be especially active from the end of July to the beginning of September when many malarial infections probably occur. It is generally accepted that the spring peak of malaria (in so far as it occurs before June) is due to infections in autumn, but the author thinks it is probable that at least a part of these infections can take place in July and August. His opinion is chiefly based on the anamnesis of cases of malaria that occurred in 1920–22 in the malaria-free town of Leyden.

Ohmori (N.). **Experimental Studies on the Influence of low Temperatures upon the tropical Bed Bug (*Cimex hemiptera* Fab.). Second Report. On the Influence of a Temperature of 3°C.** [*In Japanese.*]—*J. med. ass. Formosa* **34** pt. 6 (no. 363) pp. 702–715. Taihoku, Formosa, June 1935. (With a Summary in English.)

In these experiments [*cf. R.A.E.*, B **23** 15], eggs, nymphs and adults of *Cimex hemiptera*, F., reared in an incubator at 27°C.

[80·6°F.] and about 75 per cent. relative humidity, were suddenly exposed to 3°C. [5·4°F.] (relative humidity ranging from 50–80) for definite periods and then were returned to the incubator. The percentages of eggs that hatched when they were exposed to the lower temperature for 3, 6, 15 and 20 days were 93, 40–72, 3–17 and 0, respectively. The duration of the stage was lengthened. The shorter the period of incubation before the exposure, the longer the eggs withstood it. The third instar nymph was most resistant to the temperature, and the fourth, fifth, second and first instars, the adult female and the adult male followed it in order of resistance. In every instar unfed individuals were more resistant. An unfed third instar nymph lived 48 days during the exposure. The virility of the male was not affected, but oviposition did not take place during the exposure, and females that had begun to oviposit were more susceptible than those that had not.

KATAGAI (T.). **Seasonal Fluctuation of the Numbers of** *Musca domestica*, **L. in the City of Taihoku.** [*In Japanese.*]—*Tokyo Iji-Shimshi* no. 2929 pp. 1218–1223. Tokyo, May 1935.

On the basis of collections in 1932 and 1933 at Taihoku (Formosa), the adults of *Musca domestica*, L., were very scarce from January to April. There was a sudden increase in May. By the end of June the numbers had again decreased, but rose to a second peak in the first half of September. The peaks of abundance occurred at temperatures above 77°F. The females outnumbered the males from November to April, and the males the females from May to October.

JOBLING (B.). **An Endoparasitic Dipteran** (*Ascodipteron* **sp.**) **from the Skin of a Bat.**—*Trans. R. Soc. trop. Med. Hyg.* **29** no. 1 p. 3. London, 29th June 1935.

Notes are given on a species of the Streblid genus *Ascodipteron* taken from the skin of a bat. Adults of both sexes emerged from their puparia with fully developed wings and legs. With its enormous proboscis the female pierces the skin of the bat and drags itself into the wound where it becomes encysted after shedding its legs and wings. Its abdomen grows round its thorax and head, and in a short time it becomes flask-shaped. Only the posterior end of the abdomen protrudes through the opening in the skin of the host. Full-grown larvae, which are ejected one at a time, drop to the ground and immediately form a puparium.

LAMBORN (W. A.). **The Passage of Leprosy Bacilli through the Intestine of the Fly,** *Musca sorbens*, **Wied.**—*Trans. R. Soc. trop. Med. Hyg.* **29** no. 1 pp. 3–4. London, 29th June 1935.

Musca sorbens, Wied., haunts man and feeds readily to repletion on sores, abrasions, or mucus from the nose or mouth. A large number of these flies were fed on leprosy sores containing numerous acid-fast bacilli and control flies were fed on tropical ulcers containing no leprosy bacilli. The excreta were examined at intervals. Leprosy bacilli were numerous in the excreta passed in 8 hours and were also present in a vomit spot deposited by one of the flies 5 hours after

it had fed. In excreta passed by one fly on the 7th day there were isolated acid-fast bacilli as well as acid-fast granules. The control flies remained negative and at no time passed acid-fast bacilli. Consequently, it is possible for *M. sorbens* to transmit the bacilli of leprosy from sores to abrasions, or to the nose or mouth of man.

DAVIES (W. M.) & HOBSON (R. P.). **Sheep Blowfly Investigations. I. The Relationship of Humidity to Blowfly Attack.**—*Ann. appl. Biol.* **22** no. 2 pp. 279–293, 1 fig., 10 refs. Cambridge, May 1935.

HOBSON (R. P.). **Sheep Blowfly Investigations. II. Substances which induce** *Lucilia sericata* **Mg. to oviposit on Sheep.**—*T.c.* pp. 294–300, 10 refs.

A preliminary survey in the field of the problem of the infestation of sheep in Britain by *Lucilia sericata*, Mg. [*cf. R.A.E.*, B **22** 132] indicated the need for research work, and it is intended that the present papers shall be the first of a series dealing with various investigations in Wales, especially the causes of susceptibility to strike.

The following is mainly taken from the authors' summary of the first paper: Since the pest is more common in moist weather, an investigation was made of the effect of humidity on the larvae, and a method was devised for studying the humidity at the base of the wool, which is the site of attack. The results showed that the eggs and young larvae are extremely sensitive to desiccation at 37°C. [98·6°F.]. The fleece near the skin is more or less dry, except near the rump, and the relative humidity seldom exceeds 70 per cent. even during wet weather. Thus the microclimate at the base of the wool is normally too dry for the development of maggots, a finding confirmed by the discovery of desiccated eggs and larvae on sheep in the field. Sheep do not become infested unless predisposing conditions are present and of these humidity at the base of the wool appears to be the most important. The wool round the rump is often moist owing to soiling with faeces and urine.

In the second paper details are given of experiments on various substances that might attract flies to lay their eggs on sheep. The following is mainly taken from the author's summary: Various putrefying substances attract *L. sericata* (but no other blowflies) to oviposit on sheep in the field. The excreta of its own maggots are extremely attractive, and faeces from scouring sheep, stale urine and bacterial cultures are also attractive, but the fly will not oviposit unless these substances are placed close to the skin of a live sheep, and neither sheep skin, wool nor other live animals can take the place of sheep. The attraction is not due to chemical or bacterial changes set up by the excreta in the fleece, since actual contact of the substance with the skin or wool is not necessary. It is therefore concluded that the sheep itself plays an important part in attracting *Lucilia*; the natural odour may be responsible. The report that starlings' droppings are attractive to the fly [*cf.* **22** 184] is confirmed by these results, which suggest that any source of ammoniacal decomposition will induce oviposition. These findings should prove of value in producing strike for such experimental purposes as testing the value of repellents, and may also be useful in devising traps to capture this one species alone.

THOMPSON (G. B.). **(I) Two further Records of the Association of Hippoboscidae and Mallophaga. (II) An Anthocorid Bug feeding on** *Dermanyssus gallinae* **(Redi).**—*Ent. mon. Mag.* **71** no. 854 pp. 162–163. London, July 1935.

The author records the finding of an example of *Philopterus* sp. attached to the abdomen of an undescribed species of *Lynchia* from the Belgian Congo and of an example of *Degeeriella marginalis*, Nitzsch, attached to the side of the abdomen of *Ornithomyia chloropus*, Bergr., from Sweden.

The Anthocorid, *Orius* (*Triphleps*) *majusculus*, Reut., was observed feeding on the numerous individuals of *Dermanyssus gallinae*, DeG., that occurred in the lining of a swallow's nest in Kent.

LWOFF (M.). **Deux variétés physiologiques de** *Strigomonas culicidarum* **Noguchi et Tilden 1926.**—*Bull. Soc. Path. exot.* **28** no. 3 pp. 143–144. Paris, 1935.

LWOFF (M.). **Le pouvoir de synthèse des trypanosomides des culicides.**—*C. R. Soc. Biol.* **119** no. 24 pp. 969–971, 6 refs. Paris, 1935.

In the first paper, the author points out that the strain of *Herpetomonas* (*Strigomonas*) *culicidarum* isolated from *Culex pipiens*, L., may be distinguished from that isolated from *Anopheles quadrimaculatus*, Say [*cf. R.A.E.*, B **14** 134; **16** 17] by the fact that it can live indefinitely in peptonised water whereas the latter cannot be maintained in this medium without the addition of blood, although less than 1 part in a million is necessary. The names var. *culicis*, n., and var. *anophelis*, n., are therefore proposed for the two strains respectively.

In the second paper this information is elaborated, and it is pointed out that the two strains may be distinguished from *H.* (*S.*) *fasciculata* [*cf.* **18** 212] by culturing all three flagellates in peptonised water containing 1 per cent. haemolysed blood. After several days at 28°C. [82·4°F.] the cultures of the first two are characterised by an abundant brownish precipitate (containing pigment derived from haemoglobin), which is absent in the culture of *H. fasciculata*.

DUKE (H. L.). **Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. IX.—On the Infectivity to** *Glossina* **of the Trypanosome in the Blood of the Mammal.**—*Ann. trop. Med. Parasit.* **29** no. 2 pp. 131–143, 5 refs. Liverpool, 17th July 1935.

The following is taken from the author's conclusions : A study of the Entebbe records of transmission experiments with man's trypanosomes and *Glossina palpalis*, R.-D., lends support to Robertson's views on the endogenous cycle expressed in 1912. Of special interest is the evidence of the existence of "negative phases" in the development of the trypanosome in the mammal, phases during which the trypanosomes, though often numerous in the blood, are non-infective to the tsetse. An examination of the experimental section of this paper suggests that repeated feeds on an infected animal during a positive phase of the cycle do not increase the infection rate of the flies over that produced by one such feed.

de Buck (A.). **Infection Experiments with Quartan Malaria.**—*Ann. trop. Med. Parasit.* **29** no. 2 pp. 171–175, 10 refs. Liverpool, 17th July 1935.

The author describes experiments in Holland in which 12 batches of *Anopheles maculipennis* var. *atroparvus*, van Thiel, and 2 batches of *A. claviger*, Mg. (*bifurcatus*, auct.) were fed on patients infected with a strain of quartan malaria (*Plasmodium malariae*) from Vienna. Dissections of 386 examples of the former and 21 of the latter revealed malaria parasites in the stomach of 13 and 2 and the glands of 17 and 0 respectively. At least in the autumn, *A. claviger* lives for too short a time to be suitable for such experiments. Four persons bitten by one or more mosquitos from one of the batches of *A. maculipennis* var. *atroparvus* all developed quartan malaria. It is concluded that the extrinsic incubation period is 15 days and the intrinsic 24–25 days. This strain of quartan malaria appears only rarely to produce a sufficient number of gametocytes to infect mosquitos.

Gibbins (E. G.). *Simulium griseicolle* **Becker, from the Sudan.**—*Ann. trop. Med. Parasit.* **29** no. 2 pp. 177–184, 8 figs., 2 refs. Liverpool, 17th July 1935.

Descriptions are given of the adults of both sexes and of the larva, pupa and cocoon of *Simulium griseicolle*, Becker, which is a pest of considerable importance in parts of the Anglo-Egyptian Sudan in the region of the River Nile, where at certain seasons it appears in vast swarms and attacks man and animals.

Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Genera of the Family Muscidae Testaceae Robineau-Desvoidy based on a Comparative Study of the Male and Female Terminalia. The Genera** *Adichosia* **Surcouf and** *Auchmeromyia* **Brauer and von Bergenstamm (sens. lat.).**—*Ann. trop. Med. Parasit.* **29** no. 2 pp. 199–230, 21 figs., 7 refs. Liverpool, 17th July 1935.

In a previous paper [*R.A.E.*, B **23** 191], the author showed the close relationship between species of *Calliphora* and *ochracea*, Schin., and in the present paper he points out that for this reason the genera *Neocalliphora* and *Adichosia*, both of which were erected for *ochracea*, become synonyms of *Calliphora*.

The genus *Auchmeromyia* and the five species that it contains, *viz.*, *luteola*, F., *choerophaga*, Roub., *bequaerti*, Roub., *boueti*, Roub., and *praegrandis*, Aust., are discussed, and keys are given to the adults of both sexes. The author considers that these species represent a homogeneous group of very ancient Diptera, the larvae of which are bloodsuckers. The larvae of *A. luteola* live on the blood of man, and those of each of the other four species on that of ant-bears and wart-hogs, all these hosts being characterised by skins sparsely covered with hair. The genus is not related to the Calliphorinae and is therefore removed to a new subfamily, Auchmeromyinae.

Blacklock (D. B.). **Screencloth for Houses in the Tropics.**—*Ann. trop. Med. Parasit.* **29** no. 2 pp. 261–263, 2 refs. Liverpool, 17th July 1935.

One of the most serious objections to the screening of houses as a protection against disease-carrying mosquitos in the tropics has been

its interference with ventilation, but in many places this has now been overcome by the introduction of electricity and the consequent possibility of using fans. Another objection has been the difficulty of deciding what type of screen should be used. The author recommends MacArthur's suggestion [*R.A.E.*, B **11** 43] of 14 meshes to the linear inch of wire of no. 30 Imperial Standard Gauge for houses and of 18 of the same gauge wire or of no. 28 for water barrels and other containers in which mosquitos may breed. In the second case the smaller mesh is intended to exclude the more pliable bodies of newly-emerged *Aëdes*, which might squeeze through the wider mesh, and the more durable wire can be used as there is no question of excluding light. The price of screen cloth has been kept up largely on account of irregular orders for small quantities of various meshes with different thicknesses of wire of different metals. Barronia metal was tested in Sierra Leone and withstood the severe weather conditions well ; it is superior to phosphor-bronze and copper and compares favourably with Monel metal, which is more expensive.

De Meillon (B.). **South African Simuliidae. Part II.**—*Publ. S. Afr. Inst. med. Res.* no. 35 pp. 323–352, 8 pls., 6 refs. Johannesburg, March 1935.

In this continued paper [*cf. R.A.E.*, B **22** 211] descriptions are given of the adults of both sexes and the pupae of *Simulium magoebae*, sp. n., *S. letabum*, sp. n., and *S. lepidum*, sp. n., from the Transvaal, and of the male, the female terminalia and the pupa of *S. bovis*, De M., which was originally described from the female only [**18** 239]. In addition to the above mentioned species, the following have been taken in South Africa : *S. damnosum*, Theo., *S. adersi*, Pom., *S. debegene*, De M., *S. gilvipes*, Pom., *S. medusaeformis*, Pom., *S. nigritarsis*, Coq., *S. cervicornutum*, Pom., and *S. beckeri*, Roub., of which *S. divergens*, Pom. [**10** 106] and *S. diversipes*, Edw., are considered to be synonyms. Brief notes are given on their distribution and habitats.

De Meillon (B.). **South African Culicinae. Part I.**—*Publ. S. Afr. Inst. med. Res.* no. 35 pp. 353–365, 2 pls., 12 refs. Johannesburg, March 1935.

In the first part of this paper a list is given of the mosquitos recorded from Cape Province, which include the following Anophelines : *Anopheles listeri*, De M., *A. ardensis*, Theo., *A. coustani*, Lav. (*mauritianus*, Grp.), *A. demeilloni*, Evans, *A. gambiae*, Giles, and *A. pretoriensis*, Theo.

In the second part descriptions are given of experiments to determine by what means *Anopheles funestus*, Giles, which is essentially anthropophilous, is attracted to its host. As the mosquito is nocturnal and sight cannot be a factor, and as a preliminary experiment showed that it was attracted to man against the wind, it was considered that the host is most probably located by smell. Tests were therefore undertaken in which various chemicals were administered internally or externally to man with a view to reducing the natural body odour. The results suggest that citronella oil may act, not by repelling the mosquito but by obscuring the human odour, and that some odourless chemical might be applied externally or some substance be taken internally that would neutralise this odour without giving the body an additional smell.

In the third part of the paper the author states that an examination of the females of *A. funestus* and *A. funestus* subsp. *leesoni*, Evans, has revealed differences in the pharyngeal armature, which, taken in conjunction with the other distinguishing characters [*cf. R.A.E.*, B **21** 133; **22** 211], leads him to consider that the latter should be raised to specific rank [*cf.* **23** 186]. Christophers, in a paper already noticed [**21** 280] suggested that the subspecies might be conspecific with *A. fluviatilis*, James, but the two appear to differ in pharyngeal armature and the author has examined larvae of the latter from India and finds that the abdominal tergal plates are quite unlike.

Escomel (E). **Localisation géographique de la maladie de Carrion ou Verruga du Pérou.**—*Bull. Soc. Path. exot.* **28** no. 6 pp. 405–407. Paris, 1935.

The author discusses records showing that verruga is restricted to those zones of Peru where certain kinds of lactiferous plants are found [*cf. R.A.E.*, B **19** 112] and is transmitted by *Phlebotomus* [*cf.* **17** 189]. The principal plants involved are *Jatropha basiacantha*, *J. macrantha*, *Orthopterygium huaucui*, *Carica candicans*, *Ficus peruviana* and *Euphorbia* spp. Mackehenie and Coronado have recently found the causal organism, *Bartonella bacilliformis*, in the latex of *J. basiacantha*. The systematic destruction of all such plants in a given region has been proposed; this should afford experimental confirmation of the part played by them as reservoirs of the disease.

Roubaud (E.). **La microstructure du flotteur de l'oeuf dans les races biologiques de *Culex pipiens* L.**—*Bull. Soc. Path. exot.* **28** no. 6 pp. 443–445, 3 figs., 1 ref. Paris, 1935.

The author attempts to distinguish the races of *Culex pipiens*, L., from France (*pipiens* and *autogenicus*, Roub.) and Algeria (*berbericus*, Roub.) [*cf. R.A.E.*, B **21** 266] by means of differences in the morphology of the egg-floats. Although the characters of the egg-floats of the autogenous race from Britain [**23** 105] and that from France were not absolutely identical, the difference is not sufficient to prevent their being considered a single race.

Treillard (—). **Domesticité périodique et périodicité de la pullulation chez les anophèles extrêmes-orientaux. Remarques sur ses modalités, ses causes et son utilisation.**—*Bull. Soc. Path. exot.* **28** no. 6 pp. 448–450, 6 refs. Paris, 1935.

The author discusses the value of destroying adult Anophelines in houses as an anti-malarial measure, and points out that in the case of a species such as *Anopheles minimus*, Theo., one of the most important malaria vectors in Indo-China and other parts of the Far East, which has shown no tendency to periodic massive migrations, the destruction of the adults in houses at times when the adult population is at its lowest [*cf. R.A.E.*, B **21** 15] would probably bring about a considerable reduction in numbers. The anthropophilism of this species, as suggested by its domesticity [*cf.* **22** 241] and its low maxillary index, has been confirmed by serological tests of its stomach contents. In such species as *A. vagus*, Dön., domesticity is not apparently correlated with anthropophilism, and a high maxillary index and serological tests have shown

the species to be undoubtedly zoophilous. On the other hand, although zoophilous species with a high maxillary armature may be domestic, anthropophilous species with a low maxillary armature and the power to transmit malaria seem always to be domestic and long-lived.

TREILLARD (—). **Influence des facteurs externes sur la biologie des larves d'anophèles. I. Surface, volume, profondeur de l'eau et développement des larves de** *Pseudomyzomyia subpicta.*—*Bull. Soc. Path. exot.* **28** no. 6 pp. 451–452. Paris, 1935.

In an experiment in Indo-China, 20 young larvae of *Anopheles* (*Pseudomyzomyia*) *subpictus*, Grassi, were placed in each of four receptacles, two with diameters of 1·5 cm. and depths of 0·5 and 4 cm. respectively and the other two with diameters of 9 cm. and the same respective depths. Conditions of temperature and nourishment were similar and the liquid was renewed twice a day. The results indicated that a larger number of adults was obtained more rapidly in vessels in which the water was shallow. In nature this Anopheline often breeds in small collections of water.

GALLIARD (H.) & SAUTET (J.). **Nouvelle contribution à l'étude de l'anophélisme en Corse. Les variations saisonnières de l'indice maxillaire.**—*Bull. Soc. Path. exot.* **28** no. 6 pp. 453–456, 1 pl., 9 refs. Paris, 1935.

Examination of the maxillary indices of Anophelines in a malarious locality on the eastern plain of Corsica, where *Anopheles maculipennis* var. *labranchiae*, Flni., and *A. sacharovi*, Favr, are almost the only forms found [*cf. R.A.E.*, B **23** 45], showed that in summer, during the epidemic season, the mean ranged from 12 to 14, whereas in the winter it varied from 13 to 16. It is suggested that this may be accounted for by the ample water surface available at the beginning of summer for the development of all Anophelines, whereas in September, before the first rains, breeding places are reduced to a minimum and only the robust individuals survive [*cf.* **19** 162]. From these, hibernating females with high maxillary indices should be derived [*cf.* **16** 210]. This explains why the Anopheline fauna of the locality is zootropically unstable; it is characterised by an increased aggressiveness towards man in the summer and a tendency to avoid houses in the winter. The domestic animals are well stabled both in summer and winter and are sufficiently numerous to have permitted the development of an exclusive zoophilism, if such factors had been the only ones concerned. In the course of the winter a single example of typical *A. maculipennis*, Mg., was taken in a stable.

HU (S. M. K.). **The House-frequenting Behavior of** *Anopheles hyrcanus* **var.** *sinensis* **Wiedemann in the Shanghai Area, Part I.—Time of Entry.**—*Lingnan Sci. J.* **14** no. 3 pp. 385–394, 2 pls., 4 graphs, 6 refs. Canton, 1st July 1935.

A detailed account is given of experiments, connected with those already noticed [*R.A.E.*, B **23** 219], carried out during 1933 to determine the season and time of day at which *Anopheles hyrcanus* var. *sinensis*, Wied., enters human habitations. Collections were made in a man-baited trap consisting of a small hut with a window on each of

the four sides. It had a low ceiling and smooth white walls to facilitate the detection of the mosquitos. Once a week from 22nd June to 19th October catches were made every hour for 24 hours. The results of each hour's collection is shown in a table. No Anophelines entered the trap in the two last collections in October and only small numbers in September. The maximum number of 301 was collected on the 6th–7th July. The only 8 males taken were found during June and July, when the females were present in large numbers. On the 15 occasions when Anophelines were taken in the trap, none entered before sunset, and on 11 they began to enter within 1½ hours after. Once they had begun, they were generally found to arrive continuously throughout the night, and interruptions only occurred in the later part of the season when adult density was low. Only 6 examples were caught in the morning after 6 a.m. and only 3 in the evening before 7 p.m.

In order to determine how closely the catches in the man-baited trap, which was situated in the courtyard of farm buildings, represented actual conditions in inhabited rooms in the surrounding villages, similar observations were made in a bedroom in a different house on four occasions during August. The results, which are shown in a table and graphs, agreed fairly well with those obtained in the trap.

SCHARFF (J. W.). **A Note on Rural Public Health Administration in the Northern Settlement (Malaya) for the Year 1933.**—Fol. [3] + 35 pp. multigraph, 17 pls., 2 diagrs., 1 map, 1 table. [Penang, 1935.]

In the course of this report on the progress of public health work in rural areas of the Island of Penang, Province Wellesley and the Dindings, an account is given of the measures against Anopheline larvae undertaken for the control of malaria and of the satisfactory results obtained. The chief measures are drainage and oiling, but Paris green is applied in botanical gardens, petrol is used for wells, and larvicidal fish have proved effective in some rural reservoirs. Surveys have shown that *Anopheles maculatus*, Theo., is the principal vector, although a certain amount of malaria in Province Wellesley is due to *A. umbrosus*, Theo., and *A. sundaicus*, Rdnw., may be concerned in a single rural area of Penang.

WALCH (E. W.) & WALCH-SORGDRAGER (G. B.). **The Eggs of some Netherlands-Indian Anophelines.**—*Trans. 9th Congr. Far-East. Ass. trop. Med.* **2** pp. 65–81, 8 refs. Nanking, 1934. [Recd. August 1935.]

After giving the general characters of Anopheline eggs, the authors describe the eggs of 13 species or varieties of *Anopheles* from the Netherlands Indies (including those of *A. albotaeniatus*, Theo., and *A. punctulatus*, Dön., which are described for the first time) and, where possible, compare them with the descriptions given by Christophers & Barraud [*R.A.E.*, B **19** 167].

[SYMES (C. B.) & ROBERTS (J. I.).] **Section of Entomology.**—*Rep. med. Res. Lab. Kenya 1933* pp. 16–18. Nairobi, 1935.

The tests on oils and oil mixtures for use against Anopheline larvae have been completed and the results, some of which have already been noticed [*R.A.E.*, B **22** 169], are briefly given. Kerosene, Borneo and Persian fuel oils, and solar oil lose weight through volatilisation upon

exposure to the atmosphere, the rate increasing as the temperature rises. There appears to be little, if any, direct correlation between loss of weight and toxicity of vapours, since the vapours of Borneo fuel oil and solar oil killed larvae as quickly as those of kerosene, which loses far more weight. Larvae in contact with oils die more rapidly than those exposed to vapours only, and it is suggested that oils, particularly fuel and solar oils, depend for their action mainly upon actual penetration of larval spiracles. The effectiveness of the oils in contact with larvae was increased by a rise in temperature or exposure to sunlight; in the case of solar oil and fuel oils of low volatility, this is probably due to a lowering of surface tension and viscosity and a more rapid penetration of the spiracles. Dosages of 18–20 gals. oil per acre are effective if oiling is repeated every 7–8 days, but larger amounts must be used if the interval between applications is longer. Heavier oils, with lower proportions of light oil (solar or kerosene), should be used in districts where the normal temperatures are high. Tests of oil fractions indicated that material distilling below 270°C. is of little value, and its elimination from anti-larval oils would increase their efficacy. The most satisfactory results were obtained with fractions showing a specific gravity of 0·85 or higher, medium to light viscosity and a relatively high surface tension. Borneo fuel oil appeared to be slightly superior to Persian. A mixture of 10 parts fuel oil to 1 part solar is recommended as a substitute for the fuel and kerosene mixtures now in use.

Although some 3,000 examinations of glands of Anophelines were made during the year, no malaria parasites were found in species other than *Anopheles gambiae*, Giles (*costalis*, Theo.) and *A. funestus*, Giles.

Brief notes are given on the work carried out in connection with the control of malaria and sleeping sickness in various localities.

MACKAY (R.). **Report on Work done at Dar es Salaam during the Period January 1932–January 1934.** (With Supplementary Report on Work done during the Period January–October, 1934.) —Fol. 79 pp., 13 charts, 2 fldg. plans, 2 fldg. diagrs., 1 table, 22 refs. London, Cr. Ag. Colon., 1935. Price 10*s*.

In the main part of this report a detailed account is given of investigations begun in 1932 into the malaria situation in Dar es Salaam, where the disease was found to be hyperendemic. The way in which the Anopheline survey is being conducted is briefly outlined. The infection rate in the stomach and salivary glands of the mosquitos is being determined in the various subsections of the town in which the human parasite indices have been obtained; and the Anophelines that occur in the town and its environs are being identified, the areas examined in this case being larger and more numerous. The species that occur are *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, *A. maculipalpis*, Giles, *A. coustani*, Lav. (*mauritianus*, Grp.), *A. coustani* var. *tenebrosus*, Dön., *A. squamosus*, Theo., *A. marshalli*, Theo., and *A. gambiae* var. *melas*, Theo. Their local breeding places are discussed. *A. gambiae* and *A. funestus* appear to be the only species that frequent houses; the latter is not common in houses far from its recognised breeding places on the outskirts of the town, but larvae of the former may be found, particularly in the wet season, in roadside puddles and similar depressions throughout the town as well as in its permanent breeding foci in the creeks. Though it is usually considered

to prefer clear, clean water, it has been found breeding in certain collections of turbid, foul water, notably in an area that receives a sewage effluent, and where the water becomes mixed with sea water at the spring tides. *A. gambiae* var. *melas* is fairly common and breeds in water containing as much as 1,570 parts chlorine per 100,000 (sea water at Dar es Salaam contains about 1,825 parts). A detailed scheme for draining and filling one of the two main creeks that are the chief Anopheline breeding places is given, together with notes on proposals for dealing with smaller creeks near the most malarious area of the town. Further investigations are to be carried out before recommendations for the other main creek are made.

Humidity appears to influence sporozoite development in naturally infected Anophelines kept under laboratory conditions, since there was a definite decrease not only in the number of Anophelines with sporozoites but also in the number of parasites in each mosquito during June–August 1933, when the relative humidity was frequently as low as 65 per cent., whereas an increase in gland infection was immediately perceptible when the humidity rose to 80–90 per cent. The period between the blood meal and the appearance of sporozoites is usually 10–14 days in the wet season and 17–21 during the dry months ; the change to the shorter period appears to coincide with a rise in atmospheric temperature.

In the supplementary report certain impressions gathered in the course of entomological work are briefly mentioned. The only Anophelines showing evidence of having taken blood, caught in native dwellings, are *A. gambiae* and *A. funestus*. Most of the mosquitos in dwellings during and after the rains belong to the former species and those taken during the dry season to the latter. Furthermore, the infection rate is higher in *A. funestus* during the dry season and in *A. gambiae* during the wet season. Observations and tests showed that *A. gambiae* var. *melas* breeds in water with a salinity of 800–2,000 parts per 100,000, but that higher salinities are unfavourable to the larvae. Adults of this variety have not, however, been taken in native dwellings. An alteration of the hydrogen-ion concentration of water containing larvae of *A. gambiae* in all instars from pH 7·8 to 4·9 had no noticeable effect on their development.

DAMPF (A.). **The Occurrence of *Anopheles maculipennis* in Mexico.**—*Science* **82** no. 2121 pp. 171–172, 4 refs. New York, 23rd August 1935.

The author states that the so-called *Anopheles maculipennis*, Mg., indistinguishable in the male hypopygia from specimens from California and British Columbia, occurs throughout the whole Mexican tableland, reaching the Valley of Mexico [*cf.* also *R.A.E.*, B **23** 193]. It has apparently been confused by former authors with *A. quadrimaculatus*, Say. This finding has a special interest in view of the recent European controversies on the so-called races of *A. maculipennis* [*cf.* **23** 152, etc.]. The author considers that these include at least 2 valid species, *A. maculipennis* type (with vars. *messeae*, Flni., and *melanoon*, Hackett) and *A. labranchiae*, Flni. (with var. *atroparvus*, van Thiel). The American form, according to hypopygial characters, is not *A. maculipennis* but *A. labranchiae* [*cf.* **21** 195], but it has distinctive characters in the egg, which would justify regarding it as a separate species, for which the old name *A. occidentalis*, Dyar and Knab, should

be used. If, however, the division between the American and European forms is only of subspecific rank, the European form would bear the name *A. occidentalis* var. *labranchiae*.

Hill (R. B.), Olavarria (J.) & Rivera (J.). **Longitud de vuelo de** *A. maculipennis* (*atroparvus*). [The Length of Flight of *A. maculipennis* var. *atroparvus*.]—*Med. Países cálidos* **8** no. 6 pp. 265–268, 3 refs. Madrid, June 1935. (With a Summary in English.)

In four experiments in the province of Cáceres, Spain, to ascertain the length of flight of *Anopheles maculipennis* var. *atroparvus*, van Thiel, the only race in the region, stained females were taken in a short time at distances of from 2 to 5½ km. [1·24 to 3·42 miles] from the points of release. At 4 km. [2·49 miles] one was taken after 14 hours and several after 36. Two were captured at 5½ km. within 48 hours. The number found was sufficient to account for the presence of *Anopheles* in the centre of a zone of 4 km. radius protected by dusting with Paris green.

Scharff (J. W.). **Anti-malarial Drainage from the Point of View of the Health Officer.**—4to, xiv+104 pp., 28 figs., 1 fldg chart, 3 pp. refs. Penang, 1935.

This detailed work on anti-malarial drainage, in which an attempt is made to review the principles of the technique, is divided under the following headings: the importance of drainage as an anti-mosquito measure; the principles and objects of land drainage in connection with anti-mosquito projects; a review of Malayan methods of anti-malarial drainage in hilly land (including an appendix on the malaria-carrying range of *Anopheles*); and general drainage problems. Sections on new methods of anti-malarial sluicing, on the drainage of stone quarries and on tidal drainage have been omitted, as work on these subjects is still incomplete; and the question of levelling and grading is not discussed and no detailed descriptions of masonry drains are given, since the author considers that the collaboration of an engineer is necessary in dealing with such matters.

Johnson (H. A.). **The Effect of High Temperatures on the Length of Life of certain Species of Mosquitoes.**—*J. Tenn. Acad. Sci.* **10** no. 3 pp. 225–227, 1 graph. Nashville, Tenn., July 1935.

The effect of high temperatures on the females of *Aëdes aegypti*, L., *Anopheles quadrimaculatus*, Say, and *Culex fatigans*, Wied. (*quinquefasciatus*, auct.), was tested by placing 4 or 5 examples of the species under test in a small wire screen cage suspended from the top of a box with glass sides and heating the box to the desired temperature by electric bulbs controlled from outside. Wet and dry bulb thermometers were hung in the box close to the cage. Relative humidity, age of the insect and possible feeds were not taken into consideration. Graphs show the average results for each species. *A. aegypti* was much more resistant than the others. Temperatures as high as 106°F. did not cause a rapid shortening of its life, and it could withstand 113°F. for 30 minutes and 117°F. for 10. A temperature of 105°F. considerably shortened the life of *A. quadrimaculatus*, and at 108·5°F. it survived for only 20 minutes on an average. The graph of resistance of *C. fatigans* follows very closely that of *A. quadrimaculatus*.

REES (D. M.). **Observations on a Mosquito Flight in Salt Lake City.**—*Bull. Univ. Utah* **25** no. 5, 6 pp., 1 map. Salt Lake City, February 1935.

This is a record of observations carried on since 1929 of mosquito flights at Salt Lake City, the principal species concerned being *Aëdes campestris*, D. & K., *A. vexans*, Mg., and *A. dorsalis*, Mg., all of which occur in large numbers when conditions are favourable. *A. campestris* was most numerous in May–June, and examples were taken 10 miles from their nearest breeding places. *A. vexans* occurred in largest numbers in June–August, and its flight was traced for 5–8 miles from its nearest breeding water. The peculiar characteristics of the region near Salt Lake City render swarms of *A. dorsalis* impossible except in the west, where there is a level expanse of country, part under cultivation and irrigation and part waste land consisting of alkali and salt flats. The natural water channels are kept comparatively free from mosquito larvae by the minnow, *Leuciscus timpanogensis*, and other natural enemies, but when by means of dykes and canals the high waters are diverted from their natural channels and hundreds of acres of salt grass temporarily flooded, immense broods of *A. dorsalis* develop and their flight through the city can be readily observed. Abnormal rainfall on 26th–29th August 1932 caused abnormal flooding west of the City and an immense brood of *A. dorsalis* was produced simultaneously over a large area. Adults first emerged on 7th September, and next day men in the vicinity were obliged to abandon work and horses became unmanageable. Flights up to 22 miles from the breeding ground were observed during the following 10 days.

TRAGER (W.). **The Culture of Mosquito Larvae free from Living Micro-organisms.**—*Amer. J. Hyg.* **22** no. 1 pp. 18–25, 8 refs. Baltimore, Md, July 1935.

The following is the author's summary: Normal development of the larvae of the yellow fever mosquito, *Aëdes aegypti*, L., has been obtained, in the absence of micro-organisms, in a medium consisting of a standard autoclaved protein-free liver extract with autoclaved yeast. Larvae fail to grow if either the liver extract or the yeast is omitted.

DE BUCK (A.). **Beitrag zur Rassenfrage bei** *Culex pipiens*. [A Contribution to the Question of Races in *C. pipiens*.]—*Z. angew. Ent.* **22** no. 2 pp. 242–252, 7 refs. Berlin, July 1935.

Roubaud has differentiated two races of *Culex pipiens*, L., in France [*R.A.E.*, B **21** 266, etc.], the typical race, which is eurygamic and heterodynamic, and *C. pipiens autogenicus*, Roub., which is autogenous, stenogamic and homodynamic. Some authors have disputed Roubaud's views.

After complaints in 1932 about *C. pipiens* at Amsterdam in September, in which month the author's experience was that this species no longer feeds, engorged females from bedrooms were allowed to oviposit, and the resultant adults, though kept without any food (blood or sugar-water), produced fertile eggs, thus proving to be autogenous and stenogamic. This strain was bred further, without any blood-meals, at room temperature in summer and at 27°C. [80·6°F.] in winter. Up to the end of May 1933 twelve generations were obtained. The larvae usually required abundant food, as otherwise the larval stage

was protracted and no adults emerged. In two experiments, however, larvae kept on the starvation line produced adults, all the females being autogenous. With the typical, eurygamic race autogenous females never occurred, even when the larvae received abundant food or an abnormal diet of liver. This race was bred from larvae collected in the field in Holland or from eggs laid by hibernating females taken in a cellar.

Both races were very similar to those described by Roubaud, but the females of the typical one did not have the autotrophic fat formation prior to hibernation [*cf.* **20** 175], feeding on sugary juices being apparently indispensable. The number of teeth on the larval combs (siphonal pecta) was larger in the typical race than in the autogenous one.

Females of either race were easily crossed with males of the other and produced fertile offspring, 18 (4 per cent.) of 417 females being autogenous in the F_1 generation. It is probable that cross-bred populations occur in many localities.

IYENGAR (M. O. T.). **Biology of Indian Mosquito Larvae that attach themselves to the Roots of Water Plants.**—*Proc. R. ent. Soc. Lond.* **10** pt. 1 pp. 9–11. London, 27th June 1935.

The author describes the means by which the larvae and pupae of *Mansonia* (*Mansonioides*) *annulifera*, Theo., *M. uniformis*, Theo., *M. indiana*, Edw., and *Ficalbia hybrida*, Leic., obtain oxygen from the roots of aquatic plants. In India they utilise only *Pistia stratiotes*. In an experiment in Travancore in which *Pistia* was removed from a pond where *Mansonia* was breeding, all larvae disappeared in two days although other aquatic plants were present. Moreover, the presence of *Pistia* appears to be essential for the oviposition of *Mansonia* [*cf. R.A.E.*, B **21** 225]. A certain amount of organic contamination is also necessary in the breeding places.

Although the larvae and pupae of *Ficalbia minima*, Theo., are free living and do not depend on *Pistia* for their supply of oxygen, they were not observed in the absence of this plant ; this seems to be explained by recent observations showing that the mosquito lays its eggs on parts of the leaves of *Pistia* that overhang the water surface. The eggs of *Ficalbia* were previously unknown.

LLOYD (Ll.). **The Bacteria Beds of Sewage Works as an Environment for Insects.**—*Proc. R. ent. Soc. Lond.* **10** pt. 1 pp. 34–39, 4 diagrs. London, 27th June 1935.

In this paper are given the results of observations on the insect fauna of sewage beds in various localities in England, some of which have already been noticed [*R.A.E.*, B **22** 179]. The various types of sewage beds are briefly described. The water falling on the beds is devoid of oxygen, but is probably well oxygenated on leaving them. As the insect larvae are not immersed in the water but only washed by it, its oxygen content may not have an important direct effect on them. There is no great difference in the temperature in the beds at depths of 1 and 3 feet ; the monthly means are considerably above the mean shade temperatures, except in the height of summer, and the daily range is always less. The equable temperature is probably due to the heat of vital processes and must tend to affect the insects inhabiting the beds by

changing or protracting their seasons. The vast area and depth of the habitable zone in the beds compared with that available to the same species in nature must mean that the insects that succeed in utilising them emerge in such large numbers that inbreeding is the rule.

Over 200,000 insects have been examined, but of approximately 80 species recognised 30 occurred only once and only 2–5 examples were taken of 20 others. In addition to the species previously mentioned [*loc cit.*], *Psychoda compar*, Eat., was locally abundant ; the species of *Spathiophora* has been identified as *S. hydromyzina*, Fall. At Leeds, out of 96,000 insects, 81 per cent. were *Spaniotoma minima*, Mg., 10·7 *Metriocnemus longitarsus*, Goet., and *M. hirticollis*, Staeg., 6·6 *Psychoda alternata*, Say, 1·0 *P. severini*, Tonn., 0·3 other Diptera, 0·3 Coleoptera, 0·03 parasitic Hymenoptera and 0·01 Collembola. At Barnsley, out of 112,000 insects, 50 per cent. were *S. minima*, 23·2 *P. severini*, 8·2 *P. alternata* and 18·1 *Hypogastrura* (*Achorutes*) *viatica*, Tulb., which is introduced and cultivated [*cf.* **9** 56] ; there were no species of *Metriocnemus*. In one bed at Barnsley *P. alternata* was dominant in August and *S. minima* from September to December, when it was replaced by *P. severini*, whereas in the other, which is only a few yards distant, *P. alternata* was dominant until the middle of September, when it was replaced by *P. severini*, *S. minima* being present in comparatively small numbers. No theory has been formulated to explain the difference. According to the author's experience *P. severini* never takes less than 20 days to complete its life-cycle ; it took 12 days longer than *P. alternata* when bred in the same jars at 67°F. *M. longitarsus* requires 38 days or more at moderate room temperatures, but one brood reared at a mean temperature of 71°F. took 19–34 days, and larvae remaining died off in the following 20 days, apparently on account of the July heat ; the larvae are very sluggish in hot weather. *S. minima* requires about the same length of time as *Metriocnemus* and has successfully completed its life cycle at 71°F. in the laboratory. There may, however, be a heavy mortality among Chironomids owing to the heat of the sun on the surface stones, since their oviposition is probably mainly near the surface and the pupae of the species of *Metriocnemus* occur in the top 2–3 inches, although the larvae feed in the depths. Larvae of *M. longitarsus* and *S. minima* are inclined to attack their own pupae in the laboratory, and on one occasion when larvae of *P. alternata* were introduced by accident into a culture of *P. severini* they destroyed all the latter.

FAIR (G. M.). **The Trickling Filter Fly** (*Psychoda alternata*). **Its Habits and Control.**—*Sewage Wks J.* **6** no. 5 pp. 966–981, 3 figs., 29 refs. Easton, Pa, September 1934. (German Translation in *Z. GesundhTech. Städtehyg.* **27** no. 5 pp. 163–172 ; no. 6–7 pp. 209–216. Berlin, 1935.) [Recd. August 1935.]

The author reviews the literature on the morphology, bionomics and control of *Psychoda alternata*, Say, which breeds in the trickling filters of sewage plants [*cf. R.A.E.*, B **7** 24] in various parts of the world. The length of the life-cycle varies from 7 days at 85°F. to 22 at 60°F. The variation in the numbers of this fly at different sewage works is due chiefly to differences in structure and mode of operation. Open walls and large-sized ballast afford moist cavities where emergence and oviposition can take place without the adult fly being exposed to currents of liquid that may drown it or wash it away. Development

is also favoured by the deposition of excessive amounts of solids in the beds owing to inadequate preliminary removal of suspended matter or to choking of the surface layer by fungous growths. In badly clogged filters, however, the passageways may be so restricted and the dry surfaces so reduced that emergence and oviposition are checked. Bioflocculation (partial activated sludge treatment prior to filtration) is reported to have reduced infestation, owing to the small amount of sludge-forming material that remains. There seems to be little possibility of the fly being controlled by its natural enemies. The statement that *Hypogastrura* (*Achorutes*) *viatica*, Tulb., feeds on the larvae [**9** 56] appears to be unfounded. Podurids are herbivorous, and the fact that the two insects are not generally observed in large numbers in the same filter is probably due to the fact that *H. viatica* prefers badly clogged filters on which " ponding " occurs and these are unfavourable to *P. alternata*. In clean filters there is possibly active competition for food between them, and the prevalence of *Hypogastrura* in the top layers may force the Psychodids to penetrate deeper and thus lessen their chance of survival.

A considerable amount of work has been done on the control of these insects by means of chemicals. Orthodichlorobenzene and kerosene, and mixtures of these substances or of kerosene and pyrethrum have been used successfully against the adults in the open near trickling filters or in covered filters. It appears that the effectiveness of contact insecticides against the larvae is due in large measure to the destruction of film, unloading (the shedding of the active film from the medium) being artificially induced. With the exception of chlorine and creosote, they are reported to be too costly for general use. Continuous chlorination is expensive and may reduce the efficiency of the filter, but in most cases intermittent chlorination at weekly intervals, using quantities sufficient to give 3–5 p.p.m. in the filters during the height of the breeding season, has given satisfactory results. The intermittent application of an emulsion of creosote is reported to make the slime objectionable to the larvae for extended periods. Flies were absent when sewage was acidified with sulphuric acid to pH 3–4 and were present only in small numbers when the pH was 5–6. Adults may be destroyed by burning them in their resting places by means of a petrol torch. The construction of filters having tight walls and a surface barrier 6–12 ins. deep of well-rounded ballast less than one inch in diameter may prove an effective method of control. With this type of ballast both the under and upper surfaces are wetted with the sewage, leaving no dry crevices through which the adult flies can enter or escape from the filter. Surface clogging might be overcome by the colonisation of *Hypogastrura viatica* and chlorine might be added to the sewage. In small plants a fly-proof cover can be provided. Flooding for 24 hours appears to be the most satisfactory method of control [*cf.* **7** 90]. Drying of the filter may also be effective but usually requires a longer time than flooding and destruction of the film is also greater.

ROBERTS (R. A.). **Some North American Parasites of Blowflies.**—*J. agric. Res.* **50** no. 6 pp. 479–494, 3 figs., 12 refs. Washington, D.C., 1935.

Notes are given on the distribution, bionomics and hosts of various parasites of blowflies, most of the information having been obtained in the course of investigations carried out in Texas both on local species

and (in the laboratory only) on those that occur in other parts of the United States. The following were actually observed in the laboratory to parasitise the immature stages of blowflies, although not all of them are of economic importance: the Braconids, *Alysia ridibunda*, Say [*cf. R.A.E.*, B **20** 142] and *A. fossulata*, Prov., the Cynipids, *Psilodora* sp., *Xyalosema armata*, Say, and *Xyalosema* sp., and the Chalcids, *Brachymeria fonscolombei*, Duf. [*cf.* **21** 241] and *Eniaca texana*, Ashm., all of which attack the larvae; and the Braconid, *Aphaereta muscae*, Ashm., the Diapriid, *Trichopria hirticollis*, Ashm., and the Pteromalid, *Mormoniella vitripennis*, Wlk., which attack the pupae.

Coleman (E.). **More Insect Tragedies. Pollination of** *Nerium oleander*.—*Vict. Nat.* **52** no. 2 pp. 20–22, 1 pl., 1 fig. Melbourne, June 1935.

It is suggested that *Nerium oleander* might be useful in localities infested with blowflies, since its flowers trap the flies that pollinate them. It is recorded that one shrub in New South Wales was responsible for the deaths of thousands of flies.

Miller (W. C.). **Some Observations on the Prevention of Blow-fly attack in Sheep.**—*Scot. J. Agric.* **18** no. 3 pp. 226–231, 1 diagr. Edinburgh, July 1935.

The sheep on which the observations and experiments described were made consisted of various breeds and crosses kept for experimental purposes in the vicinity of Edinburgh where the concentration of sheep blowflies was greater than is usual in purely rural surroundings. It was noticed that brown-woolled sheep, particularly pure-bred Shetlands, were practically immune from attack. Numerous unsuccessful attempts were made to determine the nature of this immunity. It did not seem to depend on any difference in chemical composition of the wool or suint, or in the length or density of the fleece. It was not transmitted to the white progeny of a white ram and a brown Shetland ewe, but was possessed by brown cross-bred sheep. It is concluded that for some reason the brown colour of the wool of the Shetland (which is a recessive character) is unattractive to the fly, rather than that it is actively repellent.

Numerous experiments were carried out in an endeavour to find a dip that would protect ewes and lambs from blowflies. Most standard dips were tried, but none could be relied on to protect the sheep for more than 10–14 days, and few for more than 7 days when weather conditions were favourable to the flies. Experiments with spraying were then undertaken. The best results were obtained with proprietary preparations of the type known as liquid fly dips. They must be completely soluble, they must contain no solid particles that would block the fine nozzle necessary for satisfactory spraying, and, if they contain emulsified oils, they must be stable. The solution eventually adopted was used at a strength of 2½ per cent. but if flies are abnormally abundant, especially in warm, moist or thundery weather, it might be necessary to increase the concentration to 3½ per cent. The sheep were driven into pens in numbers that allowed them room to move round but left little ground visible. The best results were obtained when the fine spray was directed horizontally over the sheep from about the level of

the operator's head (or lower in a wind) and allowed to drift across the pen and settle on the heads and backs of the sheep. Any attempt to force the spray into the wool results in the excess running off and being wasted. The sheep nearest the operator move away as the spray falls on them and are replaced by others, so that the sheep in the pen are all covered in a few moments. Under ordinary conditions two gallons of solution are sufficient for 100 sheep, which can be sprayed by one man in 7–10 minutes. Normally it is not necessary to spray more than once in 10–14 days, but when the flies are numerous, or after clipping, when the wool does not retain the spray, the interval may be reduced to a week. When hot weather follows rain or when heavy rain follows spraying, an extra treatment may be required. The expense and trouble are far less in spraying than in catching and dressing sheep almost daily, and loss of condition is avoided. The system of spraying has been successfully practised by a considerable number of farmers and can be recommended where blowfly attack is severe.

Roubaud (E.) & Treillard (M.). **Un coccobacille pathogène pour les mouches tsétsés.**—*C. R. Acad. Sci. Fr.* **201** no. 4 pp. 304–306, 1 ref. Paris, 1935.

Adults of *Glossina morsitans*, Westw., obtained from pupae brought by aeroplane from Tanganyika all died soon after emerging. From one of them the authors isolated a coccobacillus, here described as *Bacterium mathisi*, sp. n., which is the first micro-organism found to be pathogenic to tsetse flies. It was not pathogenic to small laboratory animals, but killed in 3–18 hours *Lucilia sericata*, Mg., *Musca domestica*, L., *Sarcophaga carnaria*, L., *Schistocerca gregaria*, Forsk., *Carausius* (*Dixippus*) *morosus*, F., and larvae of *Galleria* [*mellonella*, L.]. Emulsions of 24 hour cultures when ingested by house flies caused an appreciable percentage of mortality after an interval ranging from 3 hours to several weeks. The bacillus had no effect on adults or larvae of mosquitos when ingested by them, and larvae of *Aëdes* [*aegypti*, L.] developed normally when fed on cultures of it. Experiments with living adults of *G. morsitans* showed that the proboscis became infected at the moment of biting when bacilli occurred on the skin of the host. This is not in accordance with conclusions from experiments with *G. palpalis*, R.-D. [*R.A.E.*, B **19** 152].

Economic Advisory Council. **East Africa Sub-Committee of the Tsetse Fly Committee. Report.**—Cmd. 4951, 56 pp. London, H.M.S.O., 1935. Price 1s.

This paper embodies the observations of this Sub-Committee on the report of the Conference on Tsetse and Trypanosomiasis (Animal and Human) [*cf. R.A.E.*, B **22** 169] and on the report of the discussions on the Human Trypanosomiasis Institute, Entebbe, that took place at the Governors' Conference at Nairobi in May 1934. In the first section a general outline is given of the problem as a whole ; in the second the main characteristics of trypanosomiasis, both animal and human, and the principal methods available for controlling it are described, and recommendations are made in regard to certain items of research recommended by the Conference, which are directly concerned with the development of those methods ; in the third section items of fundamental research, the object of which is to obtain further knowledge on

the trypanosomes that cause the disease, are discussed; in the fourth the necessity for maintaining adequate contact between scientific workers on these subjects in Africa and on cognate ones in other parts of the world is pointed out; and in the fifth the principal conclusions and recommendations of the Sub-Committee are summarised. A summary of the programme of research on *Glossina* and trypanosomiasis similar to that prepared by the Conference [*cf. loc. cit.*] is appended.

NIESCHULZ (O.). **Ueber die Verbreitung von Tabaniden in Niederländisch-Indien und ihre wirtschaftliche Bedeutung.** [The Distribution of Tabanids in the Netherland Indies and its economic Importance.]—*Z. angew. Ent.* **22** no. 1 pp. 131–142, 6 refs. Berlin, June 1935.

The Tabanids hitherto recorded from Java, Sumatra, Celebes and small adjoining islands number about 150 species, but many undescribed ones also occur. About 100 species belong to the genus *Tabanus*, *Chrysops* and *Haematopota* being the other genera of practical importance.

Notes are given on the distribution and general abundance of the following species: *Tabanus rubidus*, Wied., *T. striatus*, F., *T. immanis*, Wied., *T. fumifer*, Wlk., *T. malayensis*, Ric., *T. minimus*, Wulp, *T. ceylonicus*, Schiner, *T. rufiventris*, Macq., *T. optatus*, Wlk., *Chrysops dispar*, F., *C. flaviventris*, Macq., *C. fasciata*, Wied., *C. fixissima*, Wlk., *Haematopota javana*, Wied., *H. cingulata*, Wied., *H. pungens*, Dol., and *H. irrorata*, Macq.

From the economic point of view the density of the Tabanid population is of greater importance than the number of species. At Buitenzorg, 220 Tabanids were caught in 7 hours in sunny weather in November on a buffalo in a meadow adjoining a river and rice-fields. Of these 185 were *T. rubidus*, 34 *T. striatus* and 1 *Chrysops* sp. During 17 days in December 11,509 Tabanids, of which 7,936 were *T. rubidus* and 3,441 *T. striatus*, were collected on a small herd of buffalos. From 18th February 1926 to 2nd November 1928, 243,195 Tabanids, or a daily average of 386, were caught in connection with the author's experiments on the transmission of surra. The highest monthly total was 20,673, in February 1928, and the highest daily catch was 2,068, on 21st January 1928. The daily averages in June–August (typical of the dry season) varied from 244 to 357, and in December–February (typical of the rainy season) from 243 to 628. The eggs and larvae were correspondingly abundant. The importance of Tabanids as vectors of disease, particularly surra, anthrax and haemorrhagic septicaemia of buffalos, in the Netherlands Indies is briefly discussed, and references are given to papers on the subject [*R.A.E.*, B **17** 92, 227; **19** 99; **21** 282, etc.].

MANRESA (M.) & MONDOÑEDO (O.). **Studies on Surra: III. A Survey of the Incidence of Surra in the Vicinity of the College of Agriculture with Observations on Numerical Fluctuations of Tabanid Flies.**—*Philipp. Agric.* **24** no. 2 pp. 111–125, 1 map, 9 refs. Los Baños, July 1935.

During investigations following an outbreak of surra (*Trypanosoma evansi*) among animals belonging to the College of Agriculture, Los Baños, in 1933, observations were made on the prevalence and habits of

Tabanids, which are regarded as the chief vectors. The flies, all of which appeared to be *Tabanus striatus*, F., were found to be most abundant from 5 p.m. until dusk. Collections made within about an hour before dusk on a number of days in each month from February 1934 to March 1935 showed that the flies were present throughout the year, the daily averages varying from 3 to 42 in the different months, and the general average for the 13 months being 13·4. As many as 79 flies were caught by one man on one animal in about an hour. Strong winds with afternoon showers appeared to be unfavourable to the flies. From 1st November 1934 to 16th January 1935 observations were made on the frequency of Tabanids on a horse and an ox tied close together in an open field and an ox in a low shed about 5½ yards away, catches being made for about 20 minutes before dusk. The average number of flies caught was 0·33 on the ox in the shed, 6·02 on the ox in the field and 1·36 on the horse. No Tabanids were caught on a horse in a stall during a period in which 34 were taken on an Indian buffalo calf in a run adjoining the stall.

HOYT (R. N.) & WORDEN (R. D.). **Malaria Epidemic in Aurora, Ohio.**—*Publ. Hlth Rep.* **50** no. 27 pp. 895–897. Washington, D.C., 5th July 1935.

A brief account is given of an outbreak of malaria that occurred at Aurora, Ohio, in September and October 1934. As no case of the disease had been reported in the village since 1920, it seems probable that it was introduced by an infected person. The geographical distribution of the cases showed a remarkable concentration in relation to the first case, and all but 9 of the 37 infected persons resided within a mile, and the majority within ¼ mile, of a certain pond. A mosquito survey revealed breeding of *Anopheles punctipennis*, Say, in large numbers along the grassy banks of a river nearby and the presence of adults of *A. quadrimaculatus*, Say, in houses of both infected and uninfected persons. Adults of *A. punctipennis* were found in the house of one infected person only. The breeding places of *A. quadrimaculatus* were not definitely established, probably because oiling of the pond had been started before the survey was made. It is believed to have been the vector, since *A. punctipennis* has not been shown to transmit malaria in epidemics occurring in the United States. Dissection of 6 females of *A. quadrimaculatus* revealed no oöcysts. Control measures consisted of oiling at intervals of 10 days until the cold weather set in, the isolation of infected persons in screened enclosures and treatment with quinine or atebrin.

PHILIP (C. B.) & DAVIS (G. E.). **Tularaemia. Observations on a Strain of low initial Virulence from Rabbit Ticks.**—*Publ. Hlth Rep.* **50** no. 28 pp. 909–911. Washington, D.C., 12th July 1935.

Certain guineapigs inoculated with suspensions of ticks (*Haemaphysalis leporis-palustris*, Pack.) taken on snowshoe rabbits (*Lepus americanus columbiensis*) in British Columbia showed symptoms suggestive of a mild strain of Rocky Mountain spotted fever, but a series of lineal transfers in guineapigs showed at the fifth passage that the reactions were due to *Bacterium tularense*. The observations are of interest in view of the initial mildness of the strain and its rapid increase in virulence on passage through guineapigs.

[Hargreaves (H.).] **Annual Report of the Government Entomologist for 1934.**—*Rep. med. Dep. Uganda 1934* pp. 65–67. Entebbe, 1935.

Work in 1934 was largely devoted to investigations into the alleged connection between plague and the cotton industry. An extensive survey of field rats undertaken in Kampala showed that the commonest species of fleas were *Dinopsyllus lypusus*, J. & R., and *Ctenophthalmus cabirus*, J. & R., but that very frequently no fleas were present [*cf. R.A.E.*, B **21** 130]. *Mastomys coucha* and *Arvicanthis abyssinicus*, the commonest field rat, were not infrequently taken in houses, when they were found to harbour many more fleas (including *Xenopsylla brasiliensis*, Baker, and sometimes *X. cheopis*, Roths.) than when they were taken in the open. *Mus* (*Rattus*) *rattus* was never captured in the open except in one instance in a trap within a few yards of a hut. The prevalent flea on this species of rat in shops in Kampala was *X. cheopis* but in huts it was almost always *X. brasiliensis*.

Investigations showed that *Ornithodorus moubata*, Murr., may be found not only on the floors and walls of huts but also in the thatch where this abuts on the roof beams.

Brief comments are made on a number of local *Glossina* and mosquito surveys carried out during the year.

The Control of Typhus Fever in Kigezi.—*Rep. med. Dep. Uganda 1934* p. 68, 1 pl. Entebbe, 1935.

Typhus has been endemic in Kigezi since 1932 [*cf. R.A.E.*, B **22** 83] and a small epidemic was reported there in March–April 1934. In recent years natives from this district have migrated to other parts of Uganda in search of work and it was feared that typhus might be carried in this way to other localities. Investigations were therefore undertaken by Carnie on methods of destroying the lice [*Pediculus humanus*, L.] on native clothing, which consists chiefly of skins worn with the fur inside. To give them a pleasant smell many of the natives smoke the skins on a conical frame of twigs placed over a fire made of the roots of a local grass. By placing over this frame a slightly larger one covered with thatch and cow-dung to retain the heat and by burning cow-dung instead of grass, it was found possible to bring the heat inside up to 180°F., a temperature that killed lice and their eggs in less than half an hour ; moreover, skins treated for 8 hours suffered no damage. This method was so effective that instructions were issued that every hut-owner must use it to treat all the skins belonging to his family every week. Recent tours of inspection have shown that these instructions are readily carried out and considerable appreciation has been expressed at the increased comfort due to the reduction of lice. Sporadic cases of typhus have occurred, but only among people who have neglected this routine treatment.

Tampi (N. K.). **A Report on Plague in Peermade (Travancore State).**—*Indian med. Gaz.* **70** no. 7 pp. 383–389, 2 maps, 3 refs. Calcutta, July 1935.

The author discusses the question of plague in the Peermade district of Travancore, with particular reference to the outbreak that occurred on three estates in 1932. A review of meteorological data shows that temperature conditions may be considered favourable for the existence

of plague in epidemic form from February to May, and during the rest of the year they are not sufficiently low to prevent outbreaks. An outline is given of the results of a rat-flea survey of Peermade carried out in 1932–33 [*cf.* *R.A.E.*, B **22** 158]. The houses, which are crowded together, are dark and ill-ventilated, with holes in the floors and ceilings that afford excellent harbourage for rats, which also find shelter among the tea bushes round the lines, in the rice stores on the estates, and in the markets. Rats are also abundant in the bushes along the main road from Peermade to the Cumbum Valley, the source of the grain supply of the district, particularly round the usual halting places of the carts, where a large amount of grain escape from the bags. Villages in the Cumbum Valley have been endemic centres of plague for about 14 years, and the disease has been introduced into Peermade and other parts of Travancore on many occasions during recent years [*cf.* **22** 221].

Mazza (S.), Miyara (S.), Basso (G.) & Basso (R.). **Comprobación de *Triatoma platensis* Neiva 1913 en la provincia de Mendoza.** [The Discovery of *T. platensis* in the Province of Mendoza.]—*Publ. Misión Estud. Pat. reg. argent. Jujuy* no. 22 pp. 29–30. Buenos Aires, 1935.

Triatoma platensis, Neiva, has been found in 4 departments of the province of Mendoza, Argentina, in dwellings and goat corrals. In the houses it was associated with *T. infestans*, Klug. In one instance 1 example of *T. platensis* was found among 7 of *T. infestans*, 4 of which were infected with metacyclic forms of *Trypanosoma* (*Schizotrypanum*) *cruzi*. In the second instance, 1 adult of *T. platensis* was associated with 17 adults and 18 nymphs of *T. infestans*, and 4 adults of the latter were found to be infected.

Chopard (L.). **Die Möbelschabe, *Supella supellectilium* Serv. Ein neuerdings nach Europa eingeschlepptes Insekt.** [The Furniture Cockroach, *Phyllodromia supellectilium*. An Insect recently introduced into Europe.]—*Mitt. Ges. Vorratsschutz* **11** no. 4 pp. 51–54, 9 refs. Berlin, July 1935.

The world distribution of *Phyllodromia* (*Supella*) *supellectilium*, Serv., recently found in France [*R.A.E.*, B **21** 216], is discussed and information on its biology is given from the literature. It was particularly abundant in heated rooms in the houses infested at Paris.

Jettmar (H. M.). **Ansiedlung von Köcherfliegen in einer Wasserversorgungsanlage.** [The Establishment of Trichoptera in a Water Supply Plant.]—*Abh. Gesamtgeb. Hyg.* no. 20, vii+82 pp., 4 figs., 4 pls., 3 pp. refs. Berlin, 1935.

During the warm season, adults of Trichoptera, chiefly *Neureclipsis bimaculata*, L., and the Chironomids, *Orthocladius* (*Dactylocladius*) *brevicalcar*, Kieff., *Glyptotendipes grippekoveni*, Kieff., *Tanypus* (*Trichotanypus*) *culiciformis*, L., and *Limnochironomus* sp., have been abundant in the sand-filter plant of a reservoir supplying water to Vienna. In summer a large increase of micro-organisms, mostly such as liquefy gelatine, had been found in the filtered water. *N. bimaculata* occurred throughout the summer, but the Chironomids appeared only periodically, disappearing after a few days or weeks.

When the water was run off, the larvae of Trichoptera were found in the filter beds in such numbers as sometimes to cover the bottom. They were also found in the stomachs of small fish. Inspection of the interior surfaces of the pipes supplying the filters showed them to be covered with the larval webs, of which 100 cu. ft. were removed. After this clearance *N. bimaculata* was no longer seen in the filter plant. Larvae of the Chironomid, *G. grippekoveni*, were found in the webs, but represented less than 1 per cent. of the total larvae. A species of *Drosophila* was also noticed, but this fly had obviously been attracted to the pipes by the decomposing organic matter. A detailed account is given of the biology of *N. bimaculata* from the literature and original observations.

MacPherson (J.). **The Red-striped Spider** (*Latrodectus hasseltii*, **Thorell**).—*Aust. Zool.* **8** no. 2 pp. 145–149. Sydney, 28th June 1935.

This account of observations in New South Wales on *Latrodectus hasselti*, Thorell, one of the poisonous spiders of Australia [*R.A.E.*, B **22** 18], includes descriptions of the young and adult spider, the eggs, the cocoon, which may contain hundreds of eggs, and the web. The spiders were to be found out of doors in dark places, among rubbish, etc., and in country districts in pan and cesspit closets where most cases of bites occur. In none of the cases seen by the author was the bite dangerous, but it always caused severe suffering, sometimes persisting for days.

Jitta (N. M. J.). **Sur la destruction des moustiques à bord des aéronefs d'après les expériences des Drs. N. H. Swellengrebel et J. A. Nykamp.**—*Bull. Off. int. Hyg. publ.* **27** no. 7 pp. 1360–1361. Paris, July 1935.

The author suggests that the pyrethrum spray used in Holland to destroy Anophelines in houses [*R.A.E.*, B **22** 116] might be of value against mosquitos in aeroplanes. The quantity necessary becomes relatively less as the space increases, the rates per 1,000 cu. ft. being 4·8, 2·8 and 2·5 fl. oz. in spaces of 500–3,500 cu. ft., 4,000–6,000 cu. ft. and 7,500–12,500 cu. ft. respectively. A compressed air sprayer allowing the exact measurement of dosages and producing a mist spray about 2 yards in length is recommended.

Papers noticed by Title only.

Walch (E. W.) & Soesilo (R.). **Malaria Control in the Netherlands Indies** [a review of measures against Anopheline larvae and their results].—*Trans. 9th Congr. Far-East. Ass. trop. Med.* **2** pp. 191–200, 7 pls. (1 col.) 2 figs. Nanking, 1934. [Recd. August 1935.]

Williams (C. L.) & Dreessen (W. C.). **Sur la destruction des moustiques à bord des aéronefs.**—*Bull. Off. int. Hyg. publ.* **27** no. 7 pp. 1350–1359, 2 refs. Paris, July 1935. [Translation, see *R.A.E.*, B **23** 206.]

Bradley (M. A.). **Index to Publications of the United States Department of Agriculture 1926–1930.**—Med. 8vo, v+694 pp. Washington, D.C., Govt Ptg Office, 1935. Price, buckram, $1·50. [*Cf.* *R.A.E.*, B **21** 48.]

Thompson (G. B.). **A revised List of the British Siphonaptera.**—*Ent. mon. Mag.* **71** no. 855 pp. 181–183. London, August 1935.

Bequaert (J.). **Notes on Hippoboscidae. 10. The Genus** *Stilbometopa* **Coquillett.**—*Rev. Ent.* **5** fasc. 3 pp. 322–325, 1 fig. Rio de Janeiro, 31st August 1935.

Schwenck (J.). **Descripção de um** *Hesperoctenes* **(fam. Polyctenidae)** [parasitic on a bat in Brazil.]—*Ann. Fac. Med. Univ. S. Paulo* **11** fasc. 1 pp. 37–42, 2 figs. S. Paulo, 1935. (With a Summary in English.)

Sergent (Et.) **Quelques remarques sur les espaces intercostaux et les columelles des oeufs d'***Anopheles maculipennis.*—*Arch. Inst. Pasteur Algérie* **13** no. 2 pp. 184–187, 5 pls. Algiers, 1935.

Parrot (L.). **Notes sur les phlébotomes. XIV.—Phlébotomes de Grèce** [including a description of both sexes of *Phlebotomus bruchoni*, sp. n.]—*Arch. Inst. Pasteur Algérie* **13** no. 2 pp. 249–255, 6 figs., 14 refs. Algiers, 1935. [*Cf. R.A.E.*, B **23** 101.]

Parrot (L.). **Notes sur les phlébotomes. XVI.—Phlébotomes du Sénégal** [description of both sexes of *Phlebotomus mathisi*, sp. n.].—*Arch. Inst. Pasteur Algérie* **13** no. 2 pp. 259–262, 4 figs. Algiers, 1935.

Kirschenblatt (J.). **Eine neue** *Ixodes*-**Art aus Transkaukasien** [*I. diversicoxalis*, sp. n., from nest of *Microtus socialis satunini*].—*Zool. Anz.* **111** no. 9–10 pp. 267–268, 2 figs., 1 ref. Leipzig, 1st September 1935.

Jackson (R.). **Sur deux cas d'infection naturelle, par l'hématozoaire du paludisme, de** *A. splendidus* (*A. maculipalpis*) **dans la colonie de Hong-Kong.**—*Bull. Soc. Path. exot.* **28** no. 6 pp. 446–448, 8 refs. Paris, 1935.

Raynal (J.) & Gaschen (H.). **Sur les phlébotomes d'Indochine. VII. Présence de** *Phlebotomus iyengari* **Sinton 1933 en Indochine-Nord et description des deux sexes.**—*Bull. Soc. Path. exot.* **28** no. 6 pp. 507–517, 7 figs., 3 refs. Paris, 1935.

Snodgrass (R. E.). **Principles of Insect Morphology.**—Demy 8vo, ix+667 pp., 319 figs. New York & London, McGraw-Hill Pubg. Co., Ltd., 1935. Price 36*s.* [*Cf. R.A.E.*, A **23** 590.]

Hobson (R. P.). **Growth of Blow-fly Larvae on Blood and Serum. II. Growth in Association with Bacteria.**—*Biochem. J.* **29** no. 6 pp. 1286–1291, 2 figs., 7 refs. Cambridge, 1935. **On a fat-soluble Growth Factor required by Blow-fly Larvae. I. Distribution and Properties.**—*T.c.* pp. 1292–1296, 1 fig., 10 refs.

Smart (J.). **The internal Anatomy of the Black-fly,** *Simulium ornatum* **Mg.**—*Ann. trop. Med. Parasit.* **29** no. 2 pp. 161–170, 12 figs., 30 refs. Liverpool, 17th July 1935.

Eichler (W.). **Die Vogelparasiten. Eine Uebersicht über die verschiedenen Gruppen. i. Die Vogelwanzen.** [Bird Parasites. A Review of the different Groups. i. Bird Bugs.]—*Orn. Monatschr.* **60** no. 5–6 pp. 90–96, 1 fig., 12 refs. Göttingen, 1935.

COLLIGNON (E.). **Quelques observations sur le comportement des anophèles dans leurs abris diurnes en Algérie.**—*Arch. Inst. Pasteur Algérie* **13** no. 2 pp. 188–191. Algiers, 1935.

Collections of adults of *Anopheles maculipennis*, Mg., were made in their diurnal resting places at frequent intervals throughout the summer of 1934 in Algeria, the places most often visited being cattle sheds near large and inaccessible breeding areas. These sheds, which were unoccupied during the day, were draughtless and almost dark, and the ground was covered with liquid manure. The Anophelines were found under the tiles of the roof, on the rafters and on the upper part of the walls, particularly on the dusty cobwebs. Their numbers and position varied with the season. At the beginning of the hot weather, they were near the roof ; at the end of June, they reached their maximum numbers and spread over the walls, but never lower than 5 feet from the ground. In the course of the summer, they disappeared almost simultaneously from the various shelters. In autumn they reappeared and again sometimes rested on the walls, but as the weather grew colder and their numbers decreased, they once more retreated to the higher parts of the building. In one locality, they were first found on 24th May, disappeared on 8th August, reappeared on 4th October and finally disappeared on 29th November. In another the corresponding dates were 5th June, 1st August and 3rd October, and the mosquitos were still present when the last observation was made on 28th December. Owing to unusual weather in 1934, these dates were about a month later than those for preceding years. Certain temporary variations appeared to be correlated with atmospheric humidity. On days when there was a damp north-east wind from the sea the Anophelines in the shelters were abundant, but during the sirocco they were rare. As a rule, the adults taken were engorged females, and those observed all laid eggs of the type of var. *labranchiae*, Flni. Males were rare at the beginning of the season and were never taken later, although the shelters were only a few hundred yards from breeding places.

COLLIGNON (E.). **Observations sur les gîtes à anophélines dans le département d'Alger en 1934.**—*Arch. Inst. Pasteur Algérie* **13** no. 2 pp. 192–200, 1 graph, 3 refs. Algiers, 1935.

A detailed account is given of the abnormal weather conditions that obtained in the Department of Algiers during 1934 and their effect on the breeding places of Anophelines [*cf. R.A.E.*, B **22** 186]. The abnormally high rainfall resulted in a considerable extension of permanent breeding places and an unusual persistence of temporary ones.

AMBIALET (R.). **Activité anophélienne et conditions climatiques sur le littoral Algérien.**—*Arch. Inst. Pasteur Algérie* **13** no. 2 pp. 201–204, 2 pls., 1 graph, 1 map, 1 ref. Algiers, 1935.

With a view to determining the effect of climatic conditions on Anopheline activity, collections of mosquitos were made twice a week from April to November near a coastal village in the Department of Constantine, Algeria, and the results correlated with meteorological data obtained during the same period. The mosquitos were caught in two traps placed on rabbit hutches near a stream with marshy banks in which several species of mosquitos bred in large numbers. Those caught were almost exclusively females of *Anopheles maculipennis*, Mg.,

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and *Culex pipiens*, L., mosquitos seeking a blood meal and not shelter. The Anophelines were particularly active from 26th May to 10th July and from 1st September to 20th November, temperatures between 10 and 30°C. [50 and 86°F.] being most favourable not only for Anophelines but also for mosquitos in general. The extreme heat of summer, particularly July and August, appears to be as detrimental to activity as the excessive cold of winter, and clinical observations on the epidemiology of malaria in this locality confirm these findings. During periods of activity, the number of mosquitos captured was considerably decreased on windy days, and reduced to nil when the sirocco blew. Five other traps placed round the village over openings in sheds, etc., particularly sought by mosquitos in search of shelter or a blood meal, were regularly visited, but only one mosquito, a female *A. maculipennis*, was caught, thus showing the effectiveness of the anti-larval measures employed to protect the village.

PARROT (L.). **Notes sur les phlébotomes. XIII.—Stations africaines nouvelles de *Phlebotomus sergenti* Parr. Ses rapports avec les leishmanioses.**—*Arch. Inst. Pasteur* **13** no. 2 pp. 246–248, 8 refs. Algiers, 1935.

To the previous records of the distribution of *Phlebotomus sergenti*, Parr., in Algeria, Tunisia and Morocco, the author adds further localities in Algeria and Morocco and one in French West Africa at an altitude of about 2,000 ft. near the southern edge of the Sahara. It is often found in association with cutaneous and visceral leishmaniasis in Algeria, Tunisia and Morocco, and with visceral leishmaniasis of dogs in Algeria and Tunisia, but as *P. papatasii*, Scop., a vector of cutaneous leishmaniasis, and *P. perniciosus*, Newst., which is probably a vector of visceral leishmaniasis of man and dogs, are also present singly or together in these localities, it is impossible to estimate from its geographical distribution what part it may play in the transmission of these diseases.

PARROT (L.). **Notes sur les phlébotomes. XV. Présence en Algérie de *Phlebotomus perfiliewi* Parr., 1930.**—*Arch. Inst. Pasteur Algérie* **13** no. 2 pp. 257–258, 4 refs. Algiers, 1935.

From descriptions of *Phlebotomus macedonicus*, Adl. & Thdr. (1931) [*R.A.E.*, B **19** 218 ; **22** 3] and from an examination of examples from Hungary [*cf.* **21** 274 ; **22** 61], the author concludes that this species is identical with *P. perfiliewi*, Parr. (1930) [**21** 15], which is here recorded for the first time from Algeria.

ZUMPT (F.). **Das Glossinenmaterial der deutschen Museen, ein Beitrag zur Verbreitung der Tsetsefliegen.** [The *Glossina* Material in German Museums. A Contribution on the Distribution of Tsetse Flies.]—*Arch. Schiffs- u. Tropenhyg.* **39** no. 8 pp. 328–337, 1 map. Leipzig, 1935.

As a result of a study in 1935, the author gives a list of the species of *Glossina* in German museums, showing the places from which they were obtained. One of the objects of his work was to produce an approximate picture of the distribution of *Glossina palpalis*, R.-D., *G. palpalis fuscipes*, Newst., which he regards as a distinct species, and *G. martinii*, Zpt. [*cf.* *R.A.E.*, B **23** 160]. A map is given showing the distribution

these three forms in Africa ; *G. martinii* has only been taken in Tanganyika Territory.

The author considers that there is an essential correspondence, from both systematic and ecological standpoints, of given species of *Glossina* in East and West Africa, though the forms in the two areas are always specifically distinct. Thus 7 of the 10 species that he records from West Africa are represented by closely allied ones in East Africa, and in 5 cases they are represented by further allied species in Central Africa. He gives a list of the species found in the three regions showing which species correspond to each other.

MANCUSO (B.). **Effetti dell'insolazione sopra alcuni insetti.** [The Effects of Insolation on some Insects.]—*Ann. Igiene* **45** no. 3 pp. 180–183. Rome, March 1935. [Recd. August 1935.]

VOLPINO (G.). **La morte rapida di alcuni piccoli animali alla luce diretta solare ed a quella artificiale.** [The rapid Death of some small Animals in direct Sunshine and in artificial Light.]—*T.c.* pp. 184–187.

The first paper describes experiments directed to ascertain the action of heat, light, and ultra-violet rays on *Cimex lectularius*, L., *Pediculus capitis*, DeG., and the Tenebrionid, *Blaps mortisaga*, L., which habitually live in darkness. When exposed to direct sunshine at an air temperature of 37°C. [98·6°F.] in the sun, they died in 10–12 minutes ; at an air temperature of 40–42°C. [104–107·6°F.] they died in 5–7 minutes. The Tenebrionids, which were the most sensitive, did not die when kept in a thermostat at about 38–40°C. [100·4–104°F.] or when exposed to radiation from a quartz-mercury lamp, so that neither heat nor ultra-violet rays were alone responsible for their death under insolation. The joint effect of heat above 38°C. and of ultra-violet radiation was harmful, but much less so than that of solar radiation alone, even when the air temperature was below 38°C. It is concluded that the beetles, and to a less degree the bugs and lice, succumbed rapidly to the cumulative effect of heat and light. The second paper describes further experiments with the same insects and with mice and reaches similar conclusions.

BISHOPP (F. C.). **Ticks and the Rôle they play in the Transmission of Diseases.**—*Rep. Smithson. Instn 1932–33* (Publ. 3260) pp. 389–406, 9 pls. Washington, D.C., 1935.

After giving a general account of the bionomics of ticks, the author discusses the more important tick-borne diseases of the United States, *viz.*, Rocky Mountain spotted fever, bovine piroplasmosis, anaplasmosis, tularaemia and tick paralysis, and gives notes on the particular species of ticks that are known to be vectors of disease and on other species that are pests of domestic stock.

DICKSON (R. M.). **The Malaria Epidemic in Ceylon, 1934–35.**—*J. R. Army med. Cps* **65** no. 2 pp. 85–90. London, August 1935.

An account is given of the severe outbreak of malaria that occurred in the south-west quadrant or wet zone of Ceylon during 1934–35. During 1934 the south-west monsoon rains failed to a great extent,

and over a large part of this area a drought prevailed from May to the end of the first week in October, in which month there were occasional days of heavy rain and a minor flood in one of the river valleys. November was moderately dry and December unusually so. The disease was transmitted by *Anopheles culicifacies*, Giles, which appeared in phenomenal numbers. The drying up of the rivers, with the formation of shallow pools of clear warm water, provided ideal conditions for its breeding [*cf.* *R.A.E.*, B **23** 61], and the rains in October filled borrow pits, quarry pools and other potential breeding places, and so for several weeks multiplication was enormous. High infection rates in the mosquito were common ; 21 per cent. of the females collected in houses in one area contained oöcysts and sporozoites. *A. varuna*, Iyen., and *A. subpictus*, Grassi (*rossi*, Giles) were also taken in houses, but in very small numbers. Anti-larval measures were intensified in Colombo and other towns, but they cannot be applied to rural areas where mosquito control is not being attempted.

GUNN (W. C.). **Mosquitoes in the Glasgow District of Scotland.**—*J. R. Army med. Cps* **65** no. 2 pp. 108–112, 2 figs., 3 refs. London, August 1935.

Records of mosquito surveys show that *Anopheles claviger*, Mg. (*bifurcatus*, auct.) and five species of other genera have been taken in the Glasgow area. During 1926 an unusual number of complaints were received from people living near a marsh to the south of the city where conditions were ideal for mosquito breeding. The three species found were *A. claviger*, *Culex pipiens*, L., and *Theobaldia morsitans*, Theo. The clearing of the ditches led to the suppression of mosquito breeding in the marsh, and residents were advised to empty rain barrels at regular intervals. With regard to the possibility of malaria transmission, the author points out that although in Scotland the attainment of the necessary mean temperature for the requisite period is unlikely, it might be possible if the mosquito remained indoors.

SENEVET (G.). **Les anophèles de la France et de ses colonies. 1re Partie. France, Corse, Afrique, Madagascar, La Réunion.**—*Encycl. ent.* A **19** 4 + 361 pp., illus., 8 pp. refs. Paris, P. Lechevalier, 1935. Price, paper, *Fr.* 95 ; boards *Fr.* 105.

The author has compiled this work from the literature and from personal observations with a view to making readily available to those interested in malaria control, present knowledge on the Anophelines of France, Corsica, the French colonies in Africa, Madagascar and Réunion.

The first part deals briefly with the collection and preservation of material for study, and the second with the morphological characters of the adult, pupa and larva that are of use in identification. In the third part (pp. 27–298) descriptions are given of the known stages of those species that occur or are likely to occur in the countries under discussion, together with notes on their synonymy, bionomics, distribution and ability to transmit malaria and filariasis. The fourth part is divided into sections dealing separately with each region and giving a list of the actual or potential local species, with exact records

of their distribution and keys to the larvae, pupae and adults. In the section on the Anophelines of French West Africa and French Equatorial Africa, the individual Colonies are dealt with separately.

MATHIS (M.). **Cycle biologique complet d'*Anopheles gambiae* Giles élevé en série au laboratoire.**—*C. R. Soc. Biol.* **119** no. 27 pp. 1385–1386, 4 refs. Paris, 1935.

Between 29th April and 14th July 1935 five successive generations of *Anopheles gambiae*, Giles, were reared at Dakar. The larvae were kept in water rich in *Protococcus* to which sterile cultures of *Euglena viridis* were added. The eggs hatched in 36–40 hours, the larvae matured in 5–8 days and the adults emerged in 24 hours when the temperature ranged from 24 to 26°C. [75·2 to 78·8°F.]. The adults were active at dusk, and pairing then took place in small cages (about $7 \times 7 \times 10$ inches). The females were ready to bite a few hours after emergence, but the time of the first blood meal could be delayed by feeding them, as well as the males, on sweetened water. At least two blood meals were necessary for the maturation of the eggs within the mosquito, a process that occupied a variable time, depending on the temperature. Oviposition usually took place 6 days after the first blood meal. Under the conditions of these experiments, the life-cycle from egg to egg occupied an average of 15 days. The mosquitos showed a marked preference for the blood of man as compared with that of a guineapig.

SOESILO (R.). **The *hyrcanus* (*sinensis*) Problem in Java. (Preliminary Report.)**—*Meded. Dienst Volksgezondh. Ned.-Ind.* **24** no. 2 pp. 68–71, 5 refs. Batavia, 1935.

In the interior of southern Sumatra, *Anopheles hyrcanus*, Pall., is the chief vector of malaria [*R.A.E.*, B **20** 168], but no epidemic has been recorded from Java as due solely or chiefly to it. After it had been reported that there had been an epidemic in the Pamanoekan and Tjiasen districts of Java, where *A. hyrcanus* was the most numerous Anopheline in dwellings and where there are few cattle, the author received larvae, adults and a large number of mosquito stomachs and blood preparations from this region. Of 763 mosquitos dissected in September and October, 386 were *A. hyrcanus* and 3 of these were positive. The variety concerned was not identified in these dissections, but in further ones in November and December there were 334 *A. hyrcanus* var. *nigerrimus*, Giles, of which 7 were positive and 39 *A. hyrcanus* var. *sinensis*, Wied., of which 1 was positive. The other mosquitos in the two series of dissections were 230 *A. vagus*, Dön., 53 *A. tessellatus*, Theo., 19 *A. annularis*, Wulp (*fuliginosus*, Giles), 72 *A. subpictus*, Grassi, 54 *A. barbirostris*, Wulp, 4 *A. barbumbrosus*, Strick. & Chwd., 3 *A. kochi*, Dön., 1 *A. schüffneri*, Stant., and 8 *A. aconitus*, Dön. All were negative except 1 example of *A. aconitus*. The smallness of the numbers of this species was possibly due to the extent to which the land had been cleared, and it remains to be seen whether it will become more abundant as soon as the whole area becomes fit for continuous wet rice cultivation after the completion of the irrigation work now in progress. The larvae of both varieties of *A. hyrcanus* occurred in the same breeding places, namely swampy, fallow rice-fields, and also in the irrigation supply and outlet conduits among grass and other overgrowing vegetation.

Dampf (A.). **Nuevos datos sobre la fauna de los mosquitos de México.** [New Data on the Mosquito Fauna of Mexico.]—*Rev. mex. Biol.* **16** no. 1 pp. 1–4. Mexico, 1935.

This is a preliminary notice of Martini's paper on Mexican mosquitos [see next abstract], which is based on 7,000 specimens collected by Dampf between 1923 and 1932. Brief notes are given on the mosquitos that annoy man in various parts of Mexico. *Anopheles cricillium*, Martini [*R.A.E.*, B **22** 56] is stated to be a synonym of *A. hectoris*, Mira. The author has no record of *A. hectoris*, which he found on the high plateau of the State of Chiapas, as a vector of malaria in Mexico, but it is one of the principal vectors in the capital of Guatemala. Subsequent collection of more specimens of the Anopheline tentatively identified by Martini as *A. atropos*, D. & K., have convinced the author that from the form of the male genitalia it is closer to *A. maculipennis*, Mg. [*cf.* **23** 235, etc.].

Martini (E.). **Los mosquitos de México.**—*Bol. tec. Dep. Salub. publ. México* (A) no. 1, 65 pp., 10 figs., 1 map. Mexico, D.F., 1935.

This paper contains a generic key to the mosquitos hitherto found in Mexico, and specific keys accompanied by notes on morphology, distribution and synonymy. There are above 100 Mexican species and a further 11 from British Honduras and the Department of Petén, Guatemala, which the author considers may be conveniently included for his purpose in Mexico. Four new species are described. There are 16 species of *Anopheles* known in Mexico : *A. vestitipennis*, D. & K., *A. apicimacula*, D. & K., *A. intermedius*, Chagas, *A. punctimacula*, D. & K., *A. quadrimaculatus*, Say, *A. pseudopunctipennis*, Theo., *A. punctipennis*, Say, *A. hectoris*, Mira (of which *A. cricillium*, Martini [*R.A.E.*, B **22** 56] is a synonym), *A. parapunctipennis*, Martini, *A. albimanus*, Wied., *A. rondoni*, Neiva & Pinto, *A. argyritarsis*, R.-D., *A. crucians*, Wied., *A. bellator cruzi*, D. & K., *A. eiseni*, Coq., and an Anopheline from the neighbourhood of Mexico City doubtfully identified as *A. atropos*, D. & K. [*cf.* preceding paper], a species new to the Mexican fauna.

Trager (W.). **On the Nutritional Requirements of Mosquito Larvae** (*Aëdes aegypti*).—*Amer. J. Hyg.* **22** no. 2 pp. 475–493, 25 refs. Baltimore, Md, September 1935.

The experiments described were undertaken with a view to determining the properties of the two agents necessary to promote normal growth in larvae of *Aëdes aegypti*, L., reared in the absence of micro-organisms [*R.A.E.*, B **23** 237].

The following is taken from the author's summary. One agent, which was found to be present in yeast and aqueous yeast extracts, egg-white and wheat, is heat- and alkali-stable and is not adsorbed by fuller's earth. The other, which was found in large amounts only in partly purified liver extracts rich in anti-pernicious anaemia principle, is heat-stable, but is destroyed by alkali, and in slightly acid solution is almost completely adsorbed by fuller's earth.

Roubaud (E.), Colas-Belcour (J.) & Treillard (M.). **Influence de la concentration en sel marin sur le développement larvaire d'*Anopheles maculipennis* (var. *atroparvus*, *fallax* et *labranchiae*).** —*Bull. Soc. Path. exot.* **28** no. 7 pp. 568–571, 3 refs. Paris, 1935.

Attempts were made to rear larvae of *Anopheles maculipennis* var. *fallax*, Roub., from Normandy in small tubes containing from 36 to 2 cc. sea water (containing 34·51 gm. per litre of chloride, estimated as NaCl) made up to 40 cc. with distilled water. The mortality was rapid in the tubes with 36–10 cc. sea water; the survival increased progressively in tubes with 9–5 cc., 5 cc. giving the optimum salinity (4·31 gm.); and the mortality was higher and pupation occurred later in the tubes with 4–2 cc. and in a tube with distilled water only. In an experiment with similar dilutions, using *A. maculipennis* var. *atroparvus*, van Thiel, from Vendée and sea water containing 37·42 gm. per litre, mortality was evident from the first day in tubes with 36–12 cc., but mortality was practically nil and pupae appeared between the 24th and 34th days in tubes with 11–7 cc., 7 cc. (6·54 gm.) being the optimum. The rate of mortality did not rise with the lower concentrations. In a third experiment, using *A. maculipennis* var. *labranchiae*, Flni., from Italy, the larvae were reared in beakers containing 200, 100, 50 and 25 cc. sea water (34·51 gm.) made up to 1,000 cc. with distilled water and in 1,000 cc. distilled water alone, the larger receptacles being used to eliminate the effects of accumulation of excreta [*cf. R.A.E.*, B **19** 82]. Of 36 larvae in the beaker with 200 cc. sea water, only 8 were alive on the 15th day and only one pupa was obtained within a month. In the beakers containing 100, 50 and 25 cc. the numbers of larvae remaining on the 15th day were 20, 24 and 19 and pupae appeared on the 16th, 17th and 18th days respectively. In the distilled water, only 12 larvae survived until the 15th day and no pupae were obtained within a month.

In nature these three races have different requirements with regard to salinity, which explains the differences in the optimum concentrations, but it is clear that they are all benefited by a certain proportion of sea water.

Treillard (M.). **Sur la nutrition bactérienne expérimentale de** *Myzomyia minima*.—*Bull. Soc. Path. exot.* **28** no. 7 pp. 573–574. Paris, 1935.

From a small experiment in which attempts were made to rear larvae of *Anopheles* (*Myzomyia*) *minimus*, Theo., in different concentrations of a suspension of *Sarcina* isolated from the water of a natural breeding place of this species and cultured on gelose, it is concluded that bacteria can be utilised as food, that their presence is favourable up to a certain concentration, above which it becomes injurious, and that the first 5 or 6 days constitute the critical period, after which the mortality seems to be much lower.

Rimbaut (G.) & Mathis (M.). **Utilisation des " Poissons Millions " pour la lutte biologique contre les larves d'anophèles à Dakar.**—*Bull. Soc. Path. exot.* **28** no. 7 pp. 575–577. Paris, 1935.

Near Dakar, large numbers of small, shallow ponds of slightly saline water used for watering vegetable gardens form suitable breeding

places for Anophelines. They constitute a malarious belt round the town, the danger from which is increased by prevailing winds that sweep the peninsula longitudinally and carry swarms of mosquitos with them.

An account is given of the successful establishment of *Lebistes reticulatus* (*Girardinus guppyi*) in one such pond. When the fish (8 females and 2 males) were introduced, there were more than 1,500 mosquito larvae in 10 dips; the numbers of larvae diminished rapidly as the fish increased until, 47 days later, no larvae were found and there were over 600 fish. It is hoped now to introduce these fish into all the ponds.

MATHIS (M.). **Biologie de *Culex fatigans*, de Dakar, élevé en série au laboratoire.**—*Bull. Soc. Path. exot.* **28** no. 7 pp. 577–581, 5 refs. Paris, 1935.

During 1935, observations were made in the laboratory on the biology of *Culex fatigans*, Wied., the commonest mosquito of Dakar and its environs. Four generations were obtained between 30th March and 30th June. Pairing occurred in small cages (8 × 8 × 14 ins.). The females did not bite in the daytime except under conditions of prolonged fasting. They fed exclusively on birds and never attacked man, a food-preference that may partly explain the rarity of cases of filariasis (*Filaria bancrofti*) in Dakar. The first raft of eggs was laid 48–72 hours after the first blood meal, generally at night and never after 8 a.m. The minimum number of larvae hatching from one raft was 73 and the maximum 205, one female usually laying four rafts. The larval stage lasted 10–12 days at 24–28°C. [75·2–82·4°F.] and the pupal stage 48 hours. The maximum longevity of the adults in the laboratory was 30 days. Autogenesis was not observed. The most satisfactory breeding medium was water containing unicellular algae to which had been added pure cultures of *Euglena viridis* in peptonised broth; for fourth instar larvae powdered dried fish was also introduced. The rapidity of larval growth is directly related to the quantity of food and the size of the receptacle; a beaker about 12 inches in diameter and 4 inches deep is necessary for 200 larvae.

ROUBAUD (E.) & COLAS-BELCOUR (J.). **Essai d'extension du parasitisme de *Mormoniella vitripennis*, parasite habituel des pupes de muscides à divers arthropodes hématophages.**—*Bull. Soc. Path. exot.* **28** no. 7 pp. 601–604, 2 refs. Paris, 1935.

In experiments in which females of *Mormoniella vitripennis*, Wlk. (*Nasonia brevicornis*, Ashm.) had access to females and fed and unfed nymphs of *Ornithodorus savignyi*, Aud., fed and unfed adults and nymphs of *Argas persicus*, Oken, and fed nymphs of *Rhodnius prolixus*, Stål, no parasitism took place. The Pteromalids drove their ovipositors into the engorged ticks, but they were apparently unable to feed on the liquid produced by these lesions and died rapidly. Some of the ticks died from the lesions. Thus it is concluded that *M. vitripennis* is a specific parasite of Muscoid pupae, since they alone appear to be able to supply nourishment for the females and to bring about fertility in them [*cf. R.A.E.*, B **5** 158].

Morgan (M. T.). **Notes sur un voyage au Brésil pour étudier le service coopératif antiamaril.**—*Bull. Off. int. Hyg. publ.* **27** no. 8 pp. 1504–1533, 2 figs., 2 graphs, 2 maps, refs. Paris, August 1935.

From the end of 1934, the author spent two months in Brazil studying the work of the Co-operative Yellow Fever Service, which he here describes in detail. As examples of the value of research on the spot, he gives accounts of an outbreak of yellow fever in a rural area in Espirito Santo [*R.A.E.*, B **22** 72], and of another among the scattered population of a limited zone in the Planalto region of Matto Grosso. The inhabitants have their fields in clearings in the steep-sided valleys, but live, often some considerable distance away, on the top of the plateau in order to escape from the insects, including Simuliids and mosquitos, that swarm in the fields and the surrounding forest. *Aëdes aegypti*, L., was not found, but *A. scapularis*, Rond., was present in large numbers during the rainy season (from the end of September to the end of March). No mosquitos were observed on the top of the plateau. Most of the adults die during the dry season after laying their eggs in damp situations, but a few survivors are always to be found in the vicinity of water courses. Among the 90 definite or suspected cases of yellow fever, there were 8 deaths, which occurred between the end of March and the middle of May. No new cases were observed from June to September, but when the rainy season began, further suspected cases appeared. Although the town of Cuiaba is infested with *A. aegypti* and there is a fair amount of traffic to and from the plateau, the journey by car taking 2–3 days, no case of the disease occurred there. Anti-mosquito measures were, however, instituted, and the numbers of *A. aegypti* were very greatly reduced. The possibilities of the infection being introduced from outside the area are discussed and appear remote. Men are too scarce to act as reservoirs capable of re-infecting mosquitos during the rainy season, although by infecting mosquitos during the incubation period of the disease and for two days after, they may be the means of infecting others in their own homes. Houses are too scattered and intercourse between them too infrequent to make this method of transmission at all probable. Monkeys are the only animals that exist in large numbers and might spread the virus among the mosquitos. It is of interest that in tests of samples of blood from monkeys caught near a locality in Colombia where an outbreak of yellow fever had occurred, 4 out of 6 protected mice.

Chodzko (W.). **Une nouvelle infection à rickettsia, rickettsiaemia weigli.**—*Bull. Off. int. Hyg. publ.* **27** no. 8 pp. 1566–1569, 3 refs. Paris, August 1935.

The author gives an account of several cases of a disease that occurred among workers at the Institute of General Biology of the University of Lwow, who, because they prepare anti-typhus vaccine, are themselves vaccinated and kept under strict medical supervision. As tests for various possible diseases proved negative, uninfected lice [*Pediculus*] were fed on patients for 30–60 minutes. After several days pure cultures of an extra-cellular type of *Rickettsia* were obtained from the intestines and excreta of these lice. Lice did not become infected during the incubation period of the disease; during the

first, second and third attacks of fever, the infection rates were 5–15, 5–30 and 60–100 per cent.; and after the fever had disappeared, 60–100 per cent. Rickettsiae remained in the blood of man for several months after clinical recovery and were as pathogenic as those cultured in lice during the illness. The majority of the cases were persons on whom lice were fed, and no similar parasites had been seen in previous years, neither was the organism found in the blood of healthy persons. It has not been established to what group of rickettsia diseases this one belongs; it may possibly be due to a mutation of a hitherto non-pathogenic *Rickettsia*.

SUSSINI (M.), VACCAREZZA (R. F.) & ALVAREDO (C. A.). **Prophylaxie de la fièvre jaune. Organisation du service dans l'Argentine du Nord.**—*An. Dep. nac. Hig.* **35** p. 5. Buenos Aires, 1934. (Abstr. in *Bull. Off. int. Hyg. publ.* **27** no. 8 pp. 1603–1604. Paris, August 1935.)

Following the report of an outbreak of yellow fever at a town in Bolivia about 300 miles from the Argentine frontier, a prophylactic campaign was organised by the Argentine Government. This included the destruction of all possible breeding places of *Aëdes aegypti*, L. It was found that the development of this mosquito, which was abundant in the threatened zone, is checked by the low temperatures obtaining in July and September. The extermination of adults in houses is difficult, but the systematic destruction of breeding places brings about the disappearance of mosquitos in 60–120 days (the maximum length of life of an adult). The eggs are very resistant to high temperatures. Pupae were found at a distance of ¼ mile from houses. A list is given of the fish in the north of Argentina that might be of value in destroying mosquito larvae.

SHORTT (H. E.), SINTON (J. A.) & SWAMINATH (C. S.). **The probable Vector of Oriental Sore in the Punjab.**—*Indian J. med. Res.* **23** no. 1 pp. 271–278, 1 fig., 20 refs. Calcutta, July 1935.

Attempts to transmit oriental sore by means of the bites of laboratory-bred examples of *Phlebotomus sergenti*, Parr., were unsuccessful. It proved impossible to induce the sandflies to feed more than twice, and it is probable that it is the third and subsequent feeds that are infective [*cf. R.A.E.*, B **15** 16]. They were fed on unbroken sores whenever possible in order to avoid their death from bacterial contamination of the gut contents. They were kept under suitable conditions of humidity at a temperature of about 28°C. [82·4°F.] and examined daily. They generally oviposited on the 5th or 6th day after a full first meal and were subsequently re-fed, usually on a rabbit. Some digested their blood meal and were ready for a second feed before ovipositing, but this does not appear to be normal and often indicates an incomplete first meal. Of 49 flies dissected from 2 to 11 days after the initial feed, 20 were infected. Development of *Leishmania tropica* in the flies was very rapid and comparable in all respects to that of *L. donovani* in *P. argentipes*, Ann. & Brun. [*loc. cit.*]. Three monkeys (*Macacus rhesus*) were inoculated intradermally with the gut contents of infected sandflies. A sore containing *L. tropica* occurred at the site of inoculation of the gut contents of two flies dissected 5 days after the infecting feed, a finding contrary

to that of Adler and Theodor, who found that a minimum of 8 days in the gut of the fly was necessary before the flagellates became infective [**15** 221]. The Punjab strain of *L. tropica* develops in *P. sergenti* in a manner indicating a definite host-parasite relationship.

Rivera (J.) & Hill (R. B.). **Persistencia de los caracteres diferenciales de los huevos, larvas y adultos en diferentes generaciones de** *Anopheles maculipennis* (*atroparvus*). [The Persistance of the differential Characters of the Eggs, Larvae and Adults in different Generations of *A. maculipennis* var. *atroparvus*.]—*Med. Países cálidos* **8** no. 7 pp. 313–319, 13 refs. Madrid, July 1935. (With a Summary in English.)

The following is mainly taken from the authors' summary. Starting with a single fertilised female of *Anopheles maculipennis* var. *atroparvus*, van Thiel, six generations were bred in Spain from 5th May to 6th October 1934. In each generation the characters of the sexes, the egg and the fourth-instar larva [*R.A.E.*, B **18** 228] were examined and found true to type, although the size of the egg and float, the wing length, the maxillary index and the duration of the developmental stages varied slightly. The length of the eggs and the length of the wings became less as the summer advanced ; the life-cycle became shorter until August, but became a little longer in September.

Lopez-Neyra (C. R.) & Roselly (L. J.). **Un caso de escarabajo en el oido, con destrucción de la membrana del tímpano e invasión de la caja timpánica.** [A Case of a Beetle in the Ear, with consequent Destruction of the Tympanum and Invasion of the tympanic Cavity.]—*Med. Países cálidos* **8** no. 7 pp. 320–325, 5 refs. Madrid, July 1935.

This is a record of injury to the ear of a labourer, who was sleeping by night on straw in a field in Granada, by an adult of the Carabid, *Acinopus picipes*, Ol.

Long (J. D.). **Bubonic Plague on the West Coast of South America in 1934.**—*Publ. Hlth Rep.* **50** no. 29 pp. 923–932, 1 ref. Washington, D.C., 19th July 1935.

A brief description is given of the distribution of plague and the number of cases that have occurred since its introduction into Chile and Peru in 1903 and into Ecuador in 1908. Although the disease is still present in the last two countries, the last human case occurred in Chile in January 1930 and the last plague-infected rats were trapped in Antofagasta in 1932.

A guineapig inoculated with 9 lice (*Pediculus capitis*, DeG.) taken from the head of a plague patient a few hours before death died with symptoms typical of bubonic plague. Head lice from healthy persons allowed to feed on plague-infected guineapigs were shown by inoculation into a healthy guineapig to have become infected, but a guineapig placed in a jar with the remainder of the lice did not contract the disease. The experiment was repeated with the same results. It would seem that head lice are incapable of transmitting the disease by bites, although they may be responsible for cases in localities in Peru and Ecuador where it is the practice of natives to kill them by

crushing them between their teeth [*cf. R.A.E.*, B **19** 17]. In similar experiments with the guineapig flea, *Rhopalopsyllus cavicola*, Weij., the infection was again transmitted by inoculation but not by bites; this flea is frequently found in the clothing and bedding of the Indians of the high Andes. In experiments with *Pulex irritans*, L., the fleas transmitted the disease by biting to healthy guineapigs. Of over 1,000 fleas collected from clothing, bedding, etc., of mule drivers and other persons, 80–90 per cent. were *P. irritans*, the remainder being *R. cavicola*, *Xenopsylla cheopis*, Roths., which were scarce, and *Ctenocephalides canis*, Curt.

Outbreaks of plague occurred in Peru in 1934 in a town and a village where there are no roads. As all merchandise is transported by mules, no rats have as yet reached either locality. The mule drivers pass the nights in wayside inns, which, owing to the necessity of finding pasture for the mules, are usually on the outskirts of the town near the rice-fields, where rats are numerous. Guineapigs are commonly kept at the inns and during the cool periods of the night lie close to the drivers, who sleep on the floor or on low benches, so that there is ample opportunity for the interchange of fleas. The first case near the town, in a woman who kept an inn, was preceded by an epizootic among the guineapigs. It is believed that infected fleas were carried in the effects of the mule drivers from infected towns and transmitted the disease to the guineapigs and subsequently to the woman. In the village the outbreak occurred under similar conditions. The three other cases in the town were presumably due to the purchase of guineapigs at the place where the woman died, since the animals bought died within a few days of their arrival and the human cases occurred later. As there were no rats in either place, no measures were undertaken except the isolation of the sick and the cleaning of infected houses. Extensive poisoning operations are, however, being carried out in the rice districts of the department from which most of the merchandise for these two places is obtained. An account is given of an outbreak in Ecuador in a locality where there were apparently no rats, in which the original source of infection seemed to be fleas transported in clothing and household goods from a dwelling in which cases of plague had occurred. Such fleas as could be collected were *P. irritans*. It would appear that infected fleas had survived in the first locality, where the temperature is always very low (10°C. [50°F.] or less) and the humidity is high, from the time of the plague deaths some months previously and that when they reached the lower and warmer altitudes they became more active and transmitted the infection.

VOGEL (C. W.) & CADWALLADER (C.). **Rat-flea Survey of the Port of Philadelphia, Pa.**—*Publ. Hlth Rep.* **50** no. 30 pp. 952–957, 1 fig., 8 refs. Washington, D.C., 26th July 1935.

A rat-flea survey, similar to that undertaken at the Port of Norfolk, Va. [*cf. R.A.E.*, B **17** 135] was carried out at the Port of Philadelphia from May 1932 until December 1933, and a further survey of the same character in connection with endemic typhus from 5th January until 15th February 1934. In the first survey 2,765 rats were caught, of which all but 3 were *Mus* (*Rattus*) *norvegicus*. On 1,006 of these 4,629 fleas were taken, 2,799 being *Xenopsylla cheopis*, Roths., 1,472 *Ceratophyllus fasciatus*, Bosc, 110 *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., or *C.* (*C.*) *felis*, Bch., 54 *Leptopsylla segnis*, Schönh. (*musculi*, Dug.), and

110 *Echidnophaga gallinacea*, Westw. *X. cheopis* was most prevalent from September to November. An extremely high index for this species (8·11) recorded in July 1932 was due to fleas found on the large number of rats captured in a poultry market that has since been rat-proofed. Excluding this figure, the total flea index for the period was 1·55 and the *cheopis* index 0·90. The *cheopis* index followed fairly closely the seasonal curve of relative humidity and temperature. The higher index in the autumn would seem to indicate the possibility of plague infection spreading if it were introduced then.

[ZASUKHIN] SASSUCHIN (D. N.). **Beiträge zum Studium der phylogenetischen Entwicklung der Zecken (Ixodoidea).** [Contributions to the Study of the phylogenetic Development of Ticks.]—*Zool. Anz.* **111** no. 9–10 pp. 261–264, 19 refs. Leipzig, 1st September 1935.

From a study of records of ticks in the south-east of European Russia [*cf. R.A.E.*, B **21** 272, etc.], the author concludes that phylogenetically the Ixodoidea exhibit a very close parallel to the mammals, not only because they infest mammals most frequently, but also because they are hosts of piroplasms, which are parasites of mammalian blood. For these reasons he thinks that the parasitisation of reptiles and birds by Ixodoidea is probably a secondary adaptation.

ANDERSON (C.). **Sur la présence d'*O. erraticus* infecté par *Sp. hispanicum* dans la banlieue de Tunis.**—*Arch. Inst. Pasteur Tunis* **24** no. 3–4 pp. 483–492, 3 charts, 3 refs. Tunis, 1935.

The author records the finding of a spirochaete in *Ornithodorus erraticus*, Lucas, from the burrows of *Mus norvegicus* (*decumanus*) in a suburb of Tunis. Attempts to transmit the spirochaete to guineapigs by the bites of the tick were unsuccessful, as the ticks refused to feed, but spirochaetes were found in the blood of a guineapig 11 days after it had been inoculated with a suspension of macerated ticks. From observations on the spirochaete in laboratory animals and from cross-immunity and serological tests, it is concluded that it belongs to the group of *Spirochaeta hispanica*. It proved to be pathogenic when inoculated into a monkey (*Macacus cynomolgus*). Attempts to transmit it by means of *Xenopsylla cheopis*, Roths., *Haematopinus suis*, L., *Gliricola porcelli*, L. (*Gyropus gracilis*, Nitzsch) and *Rhipicephalus sanguineus*, Latr., were unsuccessful.

It would thus appear that infected ticks are present in northern Tunisia, where cases of relapsing fever have already been observed [*cf. R.A.E.*, B **21** 244].

ROBERTS (J. I.). **The Ticks of Rodents and their Nests, and the Discovery that *Rhipicephalus sanguineus* Latr. is the Vector of Tropical Typhus in Kenya.**—*J. Hyg.* **35** no. 1 pp. 1–22, 8 refs. Cambridge, 4th March 1935. [Recd. September 1935.]

In the first part of this paper, the author gives the results of an investigation on ticks in relation to field rodents in Kenya and on the possibility of their being concerned in the transmission of plague to such rodents, which have often been found to be immune from the disease. In experiments, ticks (*Rhipicephalus simus*, Koch, and *R. pulchellus*, Gerst.) fed on plague-infected rodents failed to transmit the

disease to other rodents, either by bites or when inoculated, and negative results were also obtained when the two species (*R. simus* and *Haemaphysalis leachi*, Aud.) taken from wild rodents were inoculated into healthy rodents. These two ticks have not been found to attack man, and *R. pulchellus*, which attacks man readily, could not be reared on rodents, so that there appears to be little or no danger of ticks transmitting diseases of rodents to human beings.

In the second part of the paper the author discusses the investigations that led to the incrimination of *Rhipicephalus sanguineus*, Latr., as a vector of tropical typhus in Kenya [*cf.* *R.A.E.*, B **21** 107] and gives further evidence, including a successful inoculation experiment with ticks from a dog, confirming this view. On the other hand a reliable person, who recently contracted a mild form of the disease, identified the male of *R. pulchellus* from among other species of ticks, as being similar to the one removed from the site of his primary lesion. That the dog serves as a reservoir of tropical typhus in Kenya has not been satisfactorily established. Preliminary observations on dogs in the area at Nairobi where infective examples of *R. sanguineus* were obtained showed that they were heavily infested with this tick and harboured comparatively few examples of *H. leachi*. Periods of heavy rainfall and cold weather apparently cause unfed examples of *R. sanguineus* in all stages to wander in search of a host and shelter; they find shelter and warmth in houses, and man may be attacked in the absence of dogs. No ticks of this species were found on cattle in areas from which cases of tropical typhus are most frequently reported. At Mombasa and Nairobi, houses stated to be heavily infested with ticks, or houses in which cases of tropical typhus had occurred yielded *R. sanguineus* only.

Pijper (A.) & Dau (H.). **South African Typhus.**—*J. Hyg.* **35** no. 1 pp. 116–124, 2 figs., 29 refs. Cambridge, 4th March 1935. [Recd. September 1935.]

The following is taken largely from the authors' summary and conclusions: In Pretoria in the summer of 1933–34 there was an outbreak of a very mild "typhus-like" disease resembling cases of "sporadic" or "mild" typhus, that had previously occurred there. A study of the virus showed that it belonged to the typhus group, and in cross-immunity experiments with the virus of the South African typhus that is transmitted by lice [*Pediculus*] and with that of tick-bite fever [*cf.* *R.A.E.*, B **23** 41], and also in other respects, it behaved exactly like the virus isolated on a previous occasion from rats in a town in South Africa where cases of "mild" or "sporadic" typhus have been known to occur for many years. This suggests that "mild" or "sporadic" typhus in South Africa is a disease of rats transmitted to man by rat-fleas. The primary sore (tick-bite) distinguishes tick-bite fever from the other two forms of typhus, but the latter can only be satisfactorily differentiated from one another by cross-immunity tests. Agglutination reactions and cross-immunity tests showed that these three forms of typhus in South Africa are not identical with similar diseases in other parts of the world. Tick-bite fever extends from the Cape to Southern Rhodesia. The typhus-like disease in Kenya [see preceding paper] is not South African tick-bite fever but seems to be identical with Marseilles fever.

MEGAW (Sir J.). **Typhus Fevers in the Tropics.**—*Trans. R. Soc. trop. Med. Hyg.* **29** no. 2 pp. 105–110. London, 31st July 1935.
FLETCHER (W.). **Typhus Fevers in Malaya.**—*Op. cit.* pp. 111–112.
FELIX (A.). **The Serology of the Typhus Group of Diseases.**—*Op. cit.* pp. 113–120, 10 refs.

In the course of these papers the past history and present knowledge of fevers of the typhus group are reviewed with particular reference to their classification, which is discussed.

JOBLING (B.). **The Effect of Light and Darkness on Oviposition in Mosquitoes.**—*Trans. R. Soc. trop. Med. Hyg.* **29** no. 2 pp. 157–166, 9 refs. London, 31st July 1935.

During June–July 1933 in England, oviposition by *Culex pipiens*, L., was observed in two ponds, but although the ponds were only five feet apart, 80 rafts were found in one and only 10 in the other. Conditions in both appeared to be similar, but the one in which more eggs were laid was in a more shady position. The laboratory experiments described were carried out to determine the effect of light and shade on this local race of *C. pipiens*, on an autogenous race from Germany, and on *C. fatigans*, Wied., from India. In an experiment with local and with fed autogenous females, in which one of the dishes of tap water in each cage was placed on a black and the other on a white disk, both races laid more eggs in the dishes on black backgrounds. In another experiment, fed autogenous females definitely preferred a dish shaded with a collar of black paper to an unshaded one, but unfed females were almost indifferent. The results were similar whether hay infusion or tap water was used in the dishes.

Experiments in which hay infusion was compared with tap water and infusions of dog biscuit and of leaves showed that hay infusion was most attractive to fed and unfed autogenous females, although the preference in unfed mosquitos was not so marked. The results with *C. fatigans* were similar to those with the unfed autogenous females, except that they showed no discrimination between infusions of hay and of dog biscuit. In these experiments, the dishes in each cage were equally illuminated. In the cage with autogenous females, 10 per cent. more rafts were laid in hay than in leaf infusion, but this percentage was raised to 46·5 when the dish of hay infusion was placed in the half of the cage opposite the wall and that of leaf infusion in the half opposite the window. When the position of the dishes was reversed, 14·1 per cent. more rafts were laid in the leaf infusion. In a similar experiment with hay infusion and tap water, in which the whole of the cage was in front of the window, but a collar was placed round the dish of tap water, the percentage laid in the hay infusion was reduced from 83·9 under equal conditions of illumination to 77·6.

Of the 4,583 egg rafts laid, all but three were laid at night ; thus the phototactic response of the mosquitos must be very acute to discern differences in illumination when the light intensity is low. The fact that the unfed autogenous females showed less marked preferences, both in regard to different infusions and to illumination, suggests that in nature the unfed females can utilise a much wider variety of waters than the fed ones. In *C. fatigans* preference was even less distinct, which confirms observations made in India that this mosquito can oviposit in almost any type of water.

Duke (H. L.). **On the Factors that may determine the Infectivity of a Trypanosome to Tsetse.**—*Trans. R. Soc. trop. Med. Hyg.* **29** no. 2 pp. 203–206, 6 refs. London, 31st July 1935.

The author discusses an experiment carried out by Corson [*R.A.E.*, B **23** 133] in which a high rate of infection was obtained in examples of *Glossina morsitans*, Westw., fed on a reedbuck infected with *Trypanosoma rhodesiense*. He points out that the rates of infection were calculated from the number of flies that survived until the end of the experiment and not from the number of flies originally fed on the infected animal, and that in the conclusion that the high rate of infectivity is connected with " the special suitability of the reedbuck's blood " it is not clear whether the individual or the species is intended. With regard to the monkey used as a control, there is some doubt whether a trypanosome in any given host attains its full power of developing in tsetse until a day or two after its first appearance in the peripheral blood, whereas in this experiment the flies were fed the day after. Moreover, if the 3 days on which the flies were fed happened to coincide with a negative phase in the cycle of the trypanosome [*cf.* **23** 228] in the monkey, the results would not be comparable. Although the passages of the strain by fly from dik-dik [**23** 65], in which the percentage of infected flies varied from 5 to 10, might be considered a better control, the dates seem to show that the clean flies were put on each dik-dik, not at the commencement of each animal's infection as in the case of the reedbuck, but several weeks later, when the transmissibility of the trypanosome might have diminished in intensity. The percentage of infective flies in the second test on the reedbuck was considerably less that in the first. Recent work at Entebbe has shown that even in an antelope, prolonged residence in a single host tends to weaken, or even destroy altogether, the power of a strain to infect fly.

Duke (H. L.). **A Note on the Behaviour of Baboon and Monitor Blood in Tsetse Flies.**—*Trans. R. Soc. trop. Med. Hyg.* **29** no. 2 pp. 207–209, 6 refs. London, 31st July 1935.

The author describes light green crystals of various types that are always found in the intestinal contents of *Glossina palpalis*, R.-D., fed on the blood of baboons. In flies fed on the monitor lizard (*Varanus*) crystals similar to some of these types are regularly present. In digested human blood a few crystals sometimes occur. The crystals also occur in *G. morsitans*, Westw., Culicines, Tabanids, *Stomoxys* and bed-bugs [*Cimex*] that have fed on baboons. Both *Varanus* and crocodile are natural sources of food for *G. palpalis*. As baboons and monitors are immune from infection with polymorphic trypanosomes, experiments were carried out in which previously infected flies were fed on these animals and subsequently dissected to determine whether their blood had any inimical effect on the development of the trypanosomes in the fly. The number of infected flies in the tests with baboons and *Varanus* was slightly less than the number in parallel tests in which the infected flies were maintained on monkey and fowl blood, but the differences were probably not significant.

Roubaud (E.). **Les modalités atypiques de l'infection trypanosomienne cyclique chez les glossines.**—*Ann. Inst. Pasteur* **55** no. 3 pp. 340–364, 5 figs., 33 refs. Paris, September 1935.

The author discusses some of the results of observations carried out in French West Africa in collaboration with G. Bouet in 1910–13 on the

development of various animal trypanosomes (including representatives of the groups of *Trypanosoma brucei*, *T. congolense* and *T. vivax*) in certain species of *Glossina* in relation to more recent findings by other workers. He is chiefly concerned with cases in which infection in the fly does not assume the form regarded as typical for the group [*cf. R.A.E.*, B **13** 64], and concludes that there may be a suppression of one or other of the stages of development, in the digestive tract, in the different parts of the proboscis or in the salivary glands. Such modifications would appear to be due in most cases to a partial spontaneous disinfection of the flies, a phenomenon that is certainly possible [*cf.* **21** 278] and easily demonstrable in the case of trypanosomes of the *vivax* group, in which development takes place in the proboscis only. In the case of the other two groups there is also the question whether, under certain conditions, the initial phase in the digestive tract may not be skipped, and the infection established immediately in the proboscis. It may also be possible in the case of polymorphic trypanosomes (*brucei*, and probably also *gambiense* and *rhodesiense*) that the intense infection of the salivary glands is not always necessary to render flies infective, and that in some flies trypanosomes in the hypopharynx and labial cavity only are capable of maintaining and reproducing the infection.

Laboratory observations are cited in which infections with trypanosomes of the *vivax* group became modified and tended to disappear in flies under unfavourable atmospheric conditions, particularly lack of humidity, or after a prolonged period even under favourable external conditions. The author therefore considers that climatic conditions cannot fail to influence the rate of infection in flies in nature. His experiments in the laboratory do not support the theory that high temperatures [*cf.* **20** 275 ; **21** 278] or the nature of the blood ingested after the infecting feed affect the development of the trypanosome in the fly.

Fontoura de Sequeira (L. A.). **Rapport de la Mission médicale à la Colonie de Guinée en 1932.**—86 pp., 9 pls., 1 fldg map, 26 graphs. Lisbon, Min. Colon., Ecole Méd. trop., 1935.

This paper on the incidence of sleeping sickness and trypanosomiasis of domestic animals in Portuguese Guinea contains a section on *Glossina*, in which the distribution, seasonal prevalence and economic importance of *G. palpalis*, R.-D., *G. longipalpis*, Wied., *G. morsitans submorsitans*, Newst., and *G. fusca*, Wlk., are discussed. A key to these four species is given. Only 7 examples of *G. fusca* were taken, all from near the southern frontier of the Colony in a locality where the country is nearly flat and is covered with dense thicket that is always green, dark and damp. *G. morsitans submorsitans* was relatively scarce and was only found in certain regions where large game still occurs in moderate numbers and where the type of country resembles park land. Of 39 examples dissected, 9 were infected with trypanosomes pathogenic to domestic animals, and it is pointed out that if this species were more numerous and widely distributed, it would be a menace to the cattle raising industry, which is one of the most important of the Colony. It has never been found in localities where large game animals are absent, and might be prevented from reaching serious numbers in the future by the encouragement of hunting.

G. longipalpis and *G. palpalis* are the most important and widespread species, the former being the vector of trypanosomiasis of animals and the latter of sleeping sickness. Owing to the proximity of the sea and the presence of many large rivers and canals, the climate of the coastal regions is more or less stable, the humidity being high and the variations in temperature small, so that the conditions in the patches of thick forest, which are composed chiefly of evergreen trees and shrubs and occur in the valleys, differ only slightly from those in the park-like areas, particularly as these are usually small, or, if they are large, are broken by clumps of forest. Thus, even in the dry season, *G. longipalpis* is found in both these types of country and in forests on the edge of rivers and canals. In one locality no horses can live and other domestic animals are seriously affected. The author considers that a large number of animals are infected while travelling along the roads. In a locality further inland, where the climatic conditions are more extreme, and large water surfaces are far distant, *G. longipalpis* takes refuge during the dry season in small patches of evergreen forest, where temperature and humidity are within the limits for its survival. The park land in these parts is not invaded, the roads are relatively free from fly and domestic animals are less affected. In the wet season the vegetation revives and the fly extends its area of distribution everywhere. It seeks particularly the edges of routes, probably because it can more easily find its hosts where vegetation is scarce or absent. It does not readily attack man, and its principal food would appear to be antelopes, which abound. The situations and positions in which the flies rest are described. Of the flies dissected 35 per cent. were infected, chiefly with cattle trypanosomes (though polymorphic trypanosomes were seen in 0·25 per cent.).

During the dry season, *G. palpalis*, which persistently attacks man, is not found in villages or on bridges along the routes. Its primary foci are evergreen forest on low ground or the wooded margins of any type of water. Some examples were, however, taken in forests where water was absent or distant. It is suggested that natives should be made to cut down trees round springs and bathing and fishing places, and along roads leading to them. In the wettest months (August and September) this species becomes more numerous and is found almost everywhere, except at high altitudes. The sharp and frequent variations in climatic factors that occur at the end of the wet season bring about a mortality among *Glossina*, which is more marked in *G. longipalpis* than in *G. palpalis*, probably because the former wanders further from its primary foci. Although a small percentage of the 334 examples of *G. palpalis* dissected contained trypanosomes pathogenic to animals, none harboured those pathogenic to man, a fact that is understandable in a country where the number of cases of sleeping sickness is small, particularly as only a small proportion of this species is infected even in countries where it is abundant and the disease is widespread.

PARISH (H. E.) & LAAKE (E. W.). **Species of Calliphoridae concerned in the Production of Myiasis in Domestic Animals, Menard County, Texas.**—*J. Parasit.* **21** no. 4 pp. 264–266. Baltimore, Md, August 1935.

During 1931–33, 46,242 flies were reared from larvae collected from the wounds of cattle, sheep and goats in a county in Texas. Analysis of the figures for each month shows that more than 99 per cent. of the

larvae obtained during the summer and autumn belonged to the genus *Cochliomyia* and over 67 per cent. of those obtained between 21st March and 26th May were *Phormia regina*, Mg. The spring collections were only made in 1933. Two examples of *Sarcophaga plinthopyga*, Wied., were reared in August 1932.

[SHTAKEL'BERG (A. A.).] **Штакельберг (А. А.). Les mouches de la partie européenne de l'URSS.** [*In Russian.*]—*Tabl. anal. Faune URSS* no. 7 742 pp., 309 figs. Leningrad, 1933. Price 22 *r.* 50 *kop.*; binding 2 *r.* 50 *kop.* [Recd. October 1935.]

This work, to which 3 specialists besides the author have contributed, comprises keys to the families, genera and species of the Diptera, other than Nematocera, of European Russia. It deals with 60 families and about 3,000 species, which include the more common and widely distributed species occurring in adjoining countries. Brief notes on the bionomics of some genera and of most of the families are also given. Introductory sections include brief general information on Diptera, a discussion of the economic importance of beneficial and injurious flies and the relation between systematic and applied entomology, and notes on morphology. There is an index to the families, genera and species.

NIESCHULZ (O.). **Ueber die Larvenstadien von *Tabanus rubidus* Wied. und *Tabanus striatus* Fabr.** [On the Larval Stages of *T. rubidus* and *T. striatus*.]—*Z. Parasitenk.* **7** no. 6 pp. 639–656, 2 figs., 13 refs. Berlin, 11th September 1935.

In further laboratory investigations the larva of *Tabanus rubidus* Wied. [*cf. R.A.E.*, B **14** 102] took 41–131 days to complete its 7–8 instars. The larva of *T. striatus*, F., passed through its 7 instars in 36–184 days. The first instar of both lasted only about 15 minutes. In the Netherlands Indies there is probably no definite series of generations. Most eggs are laid during the rainy season, but oviposition and development continue during the dry season as well.

VITZTHUM (H.). **Ueber die Gattung *Entonyssus* Ewing (Acari).**—*Z. Parasitenk.* **7** no. 6 pp. 709–716, 7 figs., 3 refs. Berlin, 11th September 1935.

Entonyssus glasmacheri, sp. n., is described from the lungs of a North American snake, *Coluber quadrivittatus*, in Berlin.

JUSTER (E.). **Contre les piqûres d'insectes. Traitement et prophylaxie.**—*La Nature* **63** no. 2 p. 181. Paris, 15th August 1935.

Formulae used by French dermatologists in the treatment of bites of mosquitos, fleas and bugs and of stings of bees and wasps are given.

EWING (H. E.). **Two new pre-Columbian Records of the American Head Louse,** *Pediculus humanus americanus.*—*Proc. helminth. Soc. Wash.* **2** no. 2 pp. 67–68. Washington, D.C., July 1935.

Fragments of *Pediculus capitis* (*humanus*) *americanus*, Ewing [*cf. R.A.E.*, B **14** 172] and several eggs were obtained from tufts of hair believed to be 1,000 years old from an old Eskimo kitchen midden in

Alaska, and an adult female, a nymph and several eggs of a variety near to *P. capitis* (*humanus*) *angustus*, Fahr. [**14** 171] from the scalp of an Indian mummy in Texas.

Jellison (W. L.). *Cephenomyia pratti* (**Diptera: Oestridae**) **reared from Blacktailed Deer.**—*Proc. helminth. Soc. Wash.* **2** no. 2 p. 69. Washington, D.C., July 1935.

In Western Montana, the blacktailed deer (*Odocoileus hemionus*) is usually infested with throat bots during the spring. In animals examined immediately after death larvae are found in the gutteral pouches of the throat only, but some hours later they are found in and emerging from the nostrils and throughout the nasal passages. Mature larvae apparently migrate through the nasal passages and are sneezed out. Pupation takes place on or in the ground. Three larvae were placed in a glass cylinder with sand at the base and partly filled with damp leaf mould, and were maintained at 4–7°C. [39·2–44·6°F.], the sand being kept moist. One larva had pupated by the 4th day. The others were not visible but were later found to have pupated 2–4 ins. below the surface of the leaf mould. After 49 days at the low temperature the cylinder was placed at 22°C. [71·6°F.]. Two adults emerged after 7 days and another on the 12th day. Five of six larvae kept at room temperature and two of five at 18°C. [64·4°F.] pupated in a few days, but only one adult was obtained. One of the reared specimens and a male taken at 10,000 feet were identified as *Cephenomyia pratti*, Hunter. The only other species of this genus known from North America in both larval and adult stages are *C. phobifer*, Clark, and *C. trompe*, Modeer.

Hull (J. B.) & Dove (W. E.). **Sand Fly Control in Mangrove Marshes.**—*Proc. helminth. Soc. Wash.* **2** no. 2 p. 69. Washington, D.C., July 1935.

The breeding of sandflies [*Culicoides* (*cf. R.A.E.*, B **22** 109, etc.)] has been stopped in experimental areas in Florida by dyking and pumping. The drying out of the soil destroys sandfly larvae, prevents the breeding of mosquitos and gradually reclaims land for agriculture.

[Zaĭtzev (F. A.).] **Зайцев (Ф. А.). The Mosquitoes of Caucasus.** [*In Russian.*]—*Trav. zool. Sect. géorg. Acad. Sci. USSR.* **1** pp. 1–31, 54 refs. Tiflis, 1934. (With a Summary in English.) [Recd. August 1935.]

Notes based on the literature and personal observations are given on the distribution and bionomics in the Caucasus of 37 species of mosquitos. The Anophelines comprise: *Anopheles maculipennis*, Mg., *A. sacharovi*, Favr. (*elutus*, Edw.), which is regarded as a variety of it, *A. hyrcanus*, Pall. (with var. *pseudopictus*, Grassi), *A. superpictus*, Grassi, and *A. pulcherrimus*, Theo., all of which are important vectors of malaria; *A. algeriensis*, Theo., recorded from North Caucasus, Daghestan and Georgia; and *A. claviger*, Mg., and *A. plumbeus*, Steph., both of which are fairly widespread. *A. maculipennis* is the most abundant and widely distributed, probably because it breeds in a greater range of waters than other Anophelines. In low-lying localities it breeds from mid-March to the end of October, and in the mountainous zone (where it occurs at altitudes of over 6,500 ft.) from May to the end

of September. In the course of the summer it may produce 3–6, and sometimes even 8, generations, depending on the altitude of the locality. It is usually accompanied by *A. sacharovi*, which is especially common in eastern Transcaucasia, and is scarce in the western part and in Daghestan. Next in abundance are *A. hyrcanus* and *A. hyrcanus* var. *pseudopictus*, which are widely distributed. The latter is very common in eastern Transcaucasia, its breeding places including swamps, rice-fields and brackish water. It seldom enters houses, but often occurs in stables and cow-sheds, and attacks domestic animals in preference to man. The adults are most numerous in the second half of summer. *A. superpictus*, which breeds in streams with a slow current and clean water, is fairly widespread, but only occurs sporadically and usually in small numbers. *A. pulcherrimus*, which is found in Azerbaijan, is abundant in dwellings and animal quarters. The adults occur from April to October and sometimes later. The larvae have been found in stagnant water in irrigation ditches.

A. hyrcanus var. *marzinovskii*, Shing., which was described from a single damaged specimen [*R.A.E.*, A **14** 129], is not considered a distinct variety, and records from the Caucasus of *A. aitkeni*, James [*loc. cit.*], *A. martinius*, Shing. [**18** 254] and *Culex fatigans*, Wied. [*cf.* **17** 198] are considered doubtful.

Aëdes aegypti, L. (*argenteus*, Poir.) is widely distributed on the Black Sea Coast and has been recorded from Baku on the Caspian [**20** 79]. The larvae, which only occur in artificial water reservoirs, are found from March to October, and the adults from May to November.

The faunistic regions from which the various Caucasian mosquitos may have originated are briefly discussed.

DIEMER (J. H.). **Over biotypen van** *Anopheles maculipennis* **Meigen, in het bijzonder in westerlijk Nederland. Een taxonomisch onderzoek.** [On the Biotypes of *A. maculipennis*, particularly in western Holland. A taxonomic Study.]—Proefschr. Rijksuniv. Leiden, xii+256 pp., 11 figs., 1 pl., 25 graphs, 11 pp. refs. Amsterdam, 1935.

This thesis, which describes work on the races of *Anopheles maculipennis*, Mg., done at Leyden from 1931 onwards, is preceded by a comprehensive review of the literature. To ascertain whether the short-winged race *atroparvus*, van Thiel, in the malarious districts of Holland is identical with this race in the non-malarious districts or whether the *atroparvus* in the latter is influenced by the long-winged race *messeae*, Flni. (thus explaining the absence of malaria), all stages of the *atroparvus* from malarious and non-malarious districts and of *messeae* were examined. The conclusion was that no reason exists for assuming *atroparvus* from the non-malarious districts to be less fitted for transmission than *atroparvus* from the malarious districts. Furthermore, a comparison of the fat-bodies of the *atroparvus* from the two types of districts and of *messeae* revealed no grounds for accepting van Thiel's hypothesis of crosses between *atroparvus* and *messeae* [*R.A.E.*, B **19** 52]. Studies of examples from stables showed that *atroparvus* was able to develop a moderately thick fat-body not only in the districts with a mixed population (non-malarious region) but also in the malarious region.

The author has applied the laws of Heincke, who in his studies on the herring first investigated the problem of races within a species,

to the adult, egg, larval and pupal characters differentiating the races of *A. maculipennis* in Holland. He concludes that it is not yet possible to find a combination of characters enabling any single specimen to be identified with certainty.

Crossing experiments are described. Captive *messeae* males usually refused to pair, but in one instance an *atroparvus* female paired with a *messeae* male laid fertile eggs, though the larvae died after one day. Though such crossings are not impossible in nature the chances of a complete and fertile F_1 generation seem very slight. This also applies to crossings of male *atroparvus* and female *messeae*, though these were obtained experimentally and the offspring matured to adults.

The systematic position and nomenclature of the forms (races) of *A. maculipennis* are discussed, and it is concluded that the typical form has a constant structure different from *messeae* and *atroparvus*, though near to the former. The various forms of *A. maculipennis* are regarded as biotypes and are considered to include *A. sacharovi*, Favr (*elutus*, Edw.).

WEIDNER (H.). **Massenauftreten von *Chloropisca notata* Meig. in Wohnhäusern.** [Outbreaks of *C. notata* in Dwelling-houses.]—*Anz. Schädlingsk.* **11** no. 8 pp. 89–91, 1 fig., 7 refs. Berlin, August 1935.

Near two houses in Hamburg that were infested by *Chloropisca notata*, Mg., there were lawns that had not been mown for over a year. As it was autumn, it was too late to identify either the grasses or the galls that were found on them. In the literature *C. notata* is recorded as having been bred from *Poa annua* and *Lolium perenne*, so that mowing such grass surfaces might prevent mass infestations indoors.

KRISHNA IYER (P. R.) & SARWAR (S. M.). **Bovine Surra in India, with a Description of a recent Outbreak.**—*Indian J. vet. Sci.* **5** pt. 2 pp. 158–170, 27 refs. Delhi, June 1935.

In the course of investigating an outbreak of surra (due to *Trypanosoma evansi*) that occurred among cattle and buffalos on a farm at Karnal in 1933, a survey to determine the possible insect vectors was carried out in November. Flies of the genus *Tabanus*, which are usually regarded as the most important agents of transmission, were absent. Of the other flies, *Philaematomyia* (*Musca*) *crassirostris*, Stein, and *Stomoxys calcitrans*, L., were the most common, *Lyperosia* sp. was fairly common and *Haematobia* (*Bdellolarynx*) sp. was scarce. Trypanosomes were found in two examples of *Haematobia* immediately after they had fed on infected animals. *Anopheles* and *Culex* were numerous, but no trypanosomes were found in mosquitos that had fed on infected animals, nor in ticks of the genus *Hyalomma* collected from some of them.

STEIN (C. D.). **Infectious Anemia or Swamp Fever in Horses.—A Review of the Bureau of Animal Industry's Investigations.**—*J. Amer. vet. med. Ass.* **87** no. 3 pp. 312–324, 9 refs. Chicago, Ill., September 1935.

This paper contains a brief reference to the unpublished results of an experiment confirming Scott's finding that swamp fever in horses can be transmitted by *Stomoxys calcitrans*, L. [*cf. R.A.E.*, B **8** 92; etc.].

Papers noticed by Title only.

Nevin (F. R.). **Anatomy of** *Cnemidocoptes mutans* **(R. and L.), the Scaly-leg Mite of Poultry.**—*Ann. ent. Soc. Amer.* **28** no. 3 pp. 338–367, 6 pls., 55 refs. Columbus, Ohio, September 1935.

Hinman (E. H.). **Biological Notes on** *Uranotaenia* **spp. in Louisiana (Culicidae, Diptera).**—*Ann. ent. Soc. Amer.* **28** no. 3 pp. 404–407, 11 refs. Columbus, Ohio, September 1935.

List of Publications on Indian Entomology, 1933.—*Misc. Bull. Coun. agric. Res. India* no. 5, 29 pp. Delhi, 1935. Price 1*s*. [*Cf. R.A.E.*, B **22** 208.]

Puri (I. M.). **Synoptic Tables for the Identification of the full-grown Larvae of the Indian Anopheline Mosquitoes.**—*Hlth Bull.* no. 16 (*Malar. Bur.* no. 7) 2nd edn (revd) 69 pp., 81 figs. Delhi, Manager of Publications, 1935. Price 5*d*. [*Cf. R.A.E.*, B **19** 72.]

Baisas (F. E.). **Notes on Philippine Mosquitoes. I. The** *Armigeres* **Group** [including 3 new species]. **II.** *Uranotaenia* **Group** [including 7 new species]. **III. Genus** *Culex* : **Groups** *Lophoceratomyia*, *Mochthogenes*, **and** *Neoculex* [including 8 new species].—*Philipp. J. Sci.* **56** no. 4 pp. 485–497, 4 pls., 3 figs., 24 refs.; **57** no. 1 pp. 63–80, 4 pls., 1 fig., 24 refs.; no. 2 pp. 167–179, 4 pls., 2 figs., 20 refs. Manila, 1935.

Paine (R. W.). **An Introduction to the Mosquitoes of Fiji. Descriptive Notes on the commoner Species, their Breeding Places and Occurrence ; together with simplified Keys for distinguishing the Adults and Larvae of Fijian Mosquitoes.**—29 pp., 3 pls., 12 refs. Suva, Dep. Agric. Fiji, 1935.

Edwards (F. W.). **A new** *Uranotaenia* [*henrardi*, sp. n.] **from the Belgian Congo (Diptera, Culicidae).**—*Rev. Zool. Bot. afr.* **27** fasc. 1 p. 96. Brussels, 25th July 1935.

Benarroch (E. I.). **Estudios relativos al paludismo en Venezuela. Observaciones acerca de los Zancudos transmisores.** [Studies related to Malaria in Venezuela. Observations on the Mosquito Vectors.]—*Bol. Soc. venezol. Cienc. nat.* no. 14 pp. 178–190, 3 pls., 12 refs. Caracas, 1934. [See *R.A.E.*, B **22** 239.] [Recd. August 1935.]

Anduze (P. J.). **Observaciones sobre larvas de** *Culex* **(Sub-Género** *Lutzia*). [Description of larva, pupa and adult female of a possible variety of *Culex bigoti*, Bellardi, from Venezuela.]—*Bol. Soc. venezol. Cienc. nat.* no. 20 pp. 438–442, 1 pl., 2 refs. Caracas, 1935.

Hingst (H. E.). **A Note on making Permanent Preparations of Anopheline Mid-guts** [infected with malaria parasites].—*Amer. J. Hyg.* **22** no. 2 pp. 278–282, 5 figs., 1 ref. Baltimore, Md, September 1935.

Monier (H.) & Treillard (M.). *Anopheles* (*Myzomyia*) *funestus* **var.** *imerinensis* **var. n. de Madagascar.**—*Bull. Soc. Path. exot.* **28** no. 7 pp. 572–573. Paris, 1935.

Senevet (G.). *Phlebotomus perniciosus* **en France** [records in two additional Departments].—*Bull. Soc. Path. exot.* **28** no. 7 p. 581, 1 ref. Paris, 1935. [*Cf. R.A.E.*, B **23** 179.]

Raynal (J.) & Gaschen (H.). **Sur les phlébotomes d'Indochine. VIII.** *Phlebotomus hivernus* **n. sp.**—*Bull. Soc. Path. exot.* **28** no. 7 pp. 582–592, 7 figs., 8 refs. Paris, 1935. **IX.** *Phlebotomus sylvaticus* **n. sp.**—*T.c.* pp. 592–601, 7 figs.

Colas-Belcour (J.). **Evolution post embryonnaire et mues de l'***Ornithodorus erraticus*.—*Bull. Soc. Path. exot.* **28** no. 7 pp. 604–606, 3 refs. Paris, 1935.

Roubaud (E.) & Colas-Belcour (J.). **Sur un ixodidé peu connu d'Extrême-Orient** *Aponomma crassipes* **Neumann 1901** [on *Varanus bivittatus* in Indo-China].—*Ann. Parasit. hum. comp.* **13** no. 5 pp. 424–429, 2 figs., 6 refs. Paris, 1st September 1935.

[Kirshenblat (Ya. D.).] **Киршенблат (Я. Д.). Zwei neue Zecken der Gattung** *Ixodes* **Latr. aus Transkaukasien.** [Two new Species of *Ixodes* from Transcaucasia.] [*In Russian.*]—*Trav. zool. Sect. géorg. Acad. Sci. USSR.* **1** pp. 257–261, 4 figs., 1 ref. Tiflis, 1934. [Recd. August 1935.]

Sen (S. K.). **The Mechanism of Feeding in Ticks.**—*Parasitology* **27** no. 3 pp. 355–368, 15 figs., 11 refs. Cambridge, 30th August 1935.

Bonnet (A.) & Timon-David (J.). **Sur quelques oiseaux de Provence et leurs acariens plumicoles.**—*Bull. Soc. linn. Provence* **5** (1931) pp. 23–30, 5 figs. Marseilles, 1932. [Recd. October 1935.] **Contribution à l'étude des acariens plumicoles.**—*Ann. Parasit. hum. comp.* **11** no. 6 pp. 442–449, 7 figs., 9 refs. Paris, November 1933. **Recherches sur les acariens plumicoles (troisième note).**—*Op. cit.* **12** no. 4 pp. 257–266, 8 figs. Paris, July 1934.

Twinn (C. R.). **Records of Mallophaga and other external Parasites from Birds at Churchill, Manitoba.**—*Canad. Ent.* **67** no. 7 pp. 157–159, 4 refs. Orillia, July 1935.

Freund (L.). **Läuse, Anoplura.** [Keys to Genera and Species of Anoplura of Central Europe.]—*Tierwelt Mitteleur.* **4** i. Teil, 3 Lief., ix, 26 pp., 116 figs., many refs. Leipzig [1935].

Wigglesworth (V. B.). **The Regulation of Respiration in the Flea,** *Xenopsylla cheopis*, **Roths. (Pulicidae).**—*Proc. roy. Soc.* (B) **118** no. 810 pp. 397–419, 13 figs., 16 refs. London, 3rd October 1935.

Wagner (J.). **Dritter Nachtrag zum** [Third Supplement to the] **Kataloge der palaearktischen Aphanipteren (Wien, 1930).**—*Konowia* **14** no. 3 pp. 217–224, 9 refs. Vienna, 15th September 1935. [*Cf. R.A.E.*, B **22** 56.]

Charnot (—) & Faure (—). **Les scorpions du Maroc** [particularly the properties and effects of their venom].—*Bull. Inst. Hyg. Maroc* **4** p. 81, 1934. (Abstr. in *Bull. Off. int. Hyg. publ.* **27** no. 8 pp. 1631–1632. Paris, August 1935.)

Kingsbury (A. N.). **Annual Report of the Malaria Advisory Board (F.M.S.) for the year 1934.**—Med. 8vo, 27 pp. Kuala Lumpur, 1935.

In April 1934, B. Barrowman reported an increase in malaria in certain areas of Selangor where it is transmitted by *Anopheles umbrosus*, Theo. This species breeds in shaded stagnant pools and marshes. Good drainage and clean weeding on rubber estates and in many villages had resulted in its control, but recently, owing to lack of funds, even main drains have been allowed to become overgrown with vegetation, their outlets have silted up and many villages are reverting to their original undrained swampy condition, so that *A. umbrosus* has reappeared and with it malaria. Malaria due to *A. sundaicus*, Rdnw., has also increased as a result of economies in maintenance of drains. In hilly areas where *A. maculatus*, Theo., is the vector, malaria has not increased to the same extent because reversion to natural conditions has diminished rather than favoured the breeding of this species. On an estate where oiling had been carried out by the brush method [*cf. R.A.E.*, B **22** 148], the incidence of malaria during April–June 1933 was 7 per cent. per month, whereas on comparable estates where spraying had been continued the rate was under 1 per cent.

There has apparently been a natural decrease in the breeding of *A. maculatus* during 1933–34, and claims of efficiency for various economical methods of oiling, which have been tested principally against this species, must therefore be regarded with caution.

In the coastal district of Selangor it has been found that, in spite of the measures on the larger estates, malaria on the landward side of the Kuala Selangor road cannot be reduced until the breeding of Anophelines on the seaward side has been controlled. Spleen rates as high as 58 per cent. have been obtained, and schemes for dyking and draining to prevent the access of sea water to agricultural land are to be instituted, but unless a piped water supply is also made available, wells will be dug and provide further breeding places for the Anophelines that the schemes are designed to eliminate. A survey of a narrow strip on either side of the road from Klang to Kuala Selangor, about 26 miles long, was carried out during 1934. The cultivated land along most of the seaward side of the road is separated from the sea by a broad belt of mangrove. On the landward side villages alternate with rubber estates. *A. barbirostris*, Wulp, *A. hyrcanus*, Pall., *A. kochi*, Dön., and *A. vagus*, Dön., were fairly evenly distributed throughout the area, whereas *A. sundaicus* and *A. umbrosus*, which are more usually malaria vectors, were more definitely localised. The limiting factor in the case of *A. sundaicus* (and of *A. baezai*, Gater) was undoubtedly the salt content of the water, although in certain cases this was extremely low in the breeding places of this species, probably as a result of the rainy weather at the time of the survey. In a mosquito net trap with human bait *A. sundaicus* and *A. umbrosus* were commonly taken (160 and 100 examples respectively), but only *A. barbirostris* was infected (1 in 118).

In three places in the Batu Gajah area, Anopheline catches made during the first six months of 1934 by means of a trap with human bait showed that the same four species predominated as in the previous year [*cf.* **23** 61]. The infection rate in *A. barbirostris* was one per cent. Records are given of the infection of this species in other localities.

The report of a sub-committee appointed to investigate the value of sluicing is appended. The following is taken from the summary and

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conclusions : Sluicing to control Anopheline larvae in streams has been tested in a variety of situations with varying results. It has not been dependable in the seepages and small water channels that form the principal breeding places of *A. maculatus*. For small streams in firm soil, for those in flat land that require treatment, and particularly for those running over rock, sluicing is likely to prove of value. It is unsuitable for streams in the more friable soil characteristic of a great part of the country, since rapid erosion results in the under-cutting of the banks, the formation of numerous side pools and the silting up of the reservoirs [*cf.* **22** 177]. Gates of temporary construction have not proved satisfactory, but may perhaps be used in places where they can be left open and where they can be set in soil well protected against erosion. Dams and reservoirs of concrete built on rock or in firm soil are believed to provide the chief field for the application of this method. The apparatus is expensive, but in suitable places is likely to be less so than oiling over a number of years.

Russell (P. F.) & Baisas (F. E.). **The Technic of handling Mosquitoes.**—*Philipp. J. Sci.* **56** no. 3 pp. 257–294, 8 pls., 12 figs., 27 refs. Manila, 1935.

Descriptions are given of the apparatus and technique necessary in collecting, transporting, rearing, preserving, mounting, and dissecting adult and larval mosquitos, preserving and mounting pupae, and distinguishing the tribes Anophelini, Culicini and Megharinini in the adult stage.

Kumm (H. W.). **Annual Report—Entomological Studies made for the Jamaica Yaws Commission during 1934.**—*Rep. Jamaica Yaws Commiss. 1934* pp. 19–30, 5 figs., 7 graphs. Kingston, Jamaica 1935.

In Jamaica flies of the genus *Hippelates* have been observed to feed in large numbers on ulcers of all kinds, including the lesions of yaws, and in 1933 investigations were begun to determine whether they were concerned in the transmission of this disease. *Hippelates pallipes*, Lw., is the commonest and most important of the 7 or 8 species of this genus that have been found in Jamaica. As many as 1,218 examples have been caught in 15 minutes at a yaws' lesion on a man's leg, and 1,395 in the same length of time at an ulcer on the leg of a donkey. Moreover 304 examples of *Spirochaeta* (*Treponema*) *pertenuis* were counted in a single fly a minute after it had fed on a lesion containing large numbers of spirochaetes. From trapping experiments in which certain species, particularly *H. pallipes*, were chiefly attracted to ulcers on man and animals, whereas other species preferred a bait consisting of a mixture of decaying liver and urea in water, it is concluded that *H. pallipes* is the species most likely to be concerned in transmission. During 1934, of 117,476 flies of the genus *Hippelates* caught, 83·92 per cent. were *H. pallipes*, which was prevalent both in localities where yaws was endemic and in some places where it did not occur.

The flies, which showed a marked preference for feeding on the lower extremities, crawled beneath the scabs and thus obtained fresh material containing living parasites. Flies that had fed on lesions apparently containing only *S. pertenuis* were found on dissection to be infected with actively motile spirochaetes of this species and of *S. refringens*, a

fact indicating that they had fed intermittently. Males fed very rarely on ulcer material. Most of the ingested blood and serum is taken directly into the oesophageal diverticulum, but when this is full, a small amount goes into the mid-gut. Afterwards, by a process of regurgitation, droplets of fluid are slowly expelled to form " vomit drops " at the end of the proboscis and are then re-swallowed into the mid-gut. A single fly deposited about 55 " vomit " and faecal drops within 24 hours of feeding, chiefly within the first 2–3 hours. Motile spirochaetes were seen in the regurgitated material. Ingested spirochaetes remained actively motile for about 7 hours in the oesophageal diverticulum, but those in the stomach and the few that remained in the proboscis rapidly lost their motility. The majority were found in the diverticulum for the first 8 hours following the infecting feed, after which they passed into the stomach. The numbers of spirochaetes in the fly decreased rapidly after the first day, and on the day following the infecting feed less than half the flies contained them. Flies were dissected every day for 14 days after the infecting feed and also after intervals of 21 and 28 days, but no spirochaetes were seen after the second day, so that there is apparently no cyclical development in the fly. Attempts to transmit the infection to rabbits by means of *H. pallipes* were all unsuccessful, but the failure is ascribed to the natural resistance of rabbits and to an unsatisfactory technique rather than to the inability of the flies to act as vectors.

A detailed account is given of observations on the bionomics of *H. pallipes*. The flies were never found feeding at night, or at sunrise or sunset ; hourly catches during the day showed that they were most numerous between 9 and 10 a.m. More flies were caught as the temperature rose, but it is possible that this effect was produced by sunshine rather than temperature. The optimum humidity seemed to range from 70 to 80 per cent. The flies were seldom found in houses and preferred to rest on the undersides of the leaves of bushes and particularly on those of *Gliricidia maculata*. In the laboratory they were kept alive for ten weeks in petri dishes with a little granulated sugar. A few were reared on wet sand from larvae fed on a mixture of decaying dog dung and rotting cardboard. Viable eggs were obtained from fed females kept in petri dishes with sugar and water.

BABIĆ (I.), BARANOV (N.) & GANSLMAYER (R.). **Die Kolumbatscher-Mücke im Jahre 1934.** [The Golubatz Fly in 1934.]—*Arch. Tierheilk.* **69** no. 3 pp. 205–212, 2 maps. Berlin, 1935.

This paper gives an account of the outbreak of *Simulium reptans columbaczense*, Schönb., in Jugoslavia, Rumania and Bulgaria during 1934 [*R.A.E.*, B **22** 203, **23** 161].

[BARANOV] BARANOFF (N.). **Neues über die Kolumbatscher-Mücke** (*Simulium columbaczense* **Schönb**.). [New Information on the Golubatz Fly, *S. columbaczense*.]—*Arb. morph. taxon. Ent. Berl.* **2** no. 3 pp. 156–158. Berlin, August 1935.

This paper records further investigations on the outbreak of the Golubatz fly in 1934 [see preceding abstract]. The immature stages of the fly had been known, as it was supposed, only by material from small expanses of water, but this material was too scanty to account for the vast numbers involved in the outbreak, so that it was naturally

suspected that these small streams were not the true breeding places. Subsequent investigations showed that the principal breeding place is the Danube at the Iron Gate [*R.A.E.*, B **22** 203], but that there are also important foci on the Nišava and Morava in north-eastern Jugoslavia. The author at first believed that the proper name for the fly was *Simulium reptans columbaczense*, Schönb. At the beginning of his investigation he had found small morphological differences between the adults reared from material collected in small streams and the flies that had been taken destroying animals, but he thought that they only came within the range of individual variation. But the examination of large numbers of pupae from the Danube showed that they all had 10 filaments instead of 8 (which is the number of filaments in *S. reptans*, L.), and besides, the adults from these pupae were all identical with the true cattle-destroying Golubatz fly. Further examination of the material used in the previous year showed that the differences between the adults of *reptans* and *columbaczense*, though small, are constant, so that the latter should be regarded as a distinct species. Again, all previous records of the breeding places of the fly, small streams and mountain streams [*cf.* **23** 161, **22** 204], refer exclusively to *reptans*, whereas the Danube and other large rivers come into the question only as breeding places of *columbaczense*. Despite the similarity in the adults of *reptans* and *columbaczense*, the great differences between larvae and pupae and the capacity of *columbaczense* for great and destructive mass increase lead the author to erect a new subgenus, *Danubeosimulium*, for *S. columbaczense* alone.

IWANOFF (X.). **Ueber Sommerwunden beim Rinde.** [Summer Sores in Cattle.]—*Arch. Tierheilk.* **67** pp. 261–270, 3 figs., 7 refs. Berlin, 1934. [Recd. October 1935.]

Various summer sores in horses, dogs and cattle due to parasitic infestations are noted from the literature. Sores affecting cattle in Bulgaria and damaging the hides are described. They are due to Nematode larvae of which the vectors are *Stomoxys calcitrans*, L., and *Musca domestica*, L. Of 780 flies examined in one village 5 per cent. harboured the larvae.

GENEVRAY (J.), GASCHEN (H.), AUTRET (M.) & DODERO (J.). *Paederus* **vésicants** (*P. fuscipes* **et** *P. alternans*) **au Tonkin. Etude entomologique, clinique et expérimentale.**—*Arch. Inst. Pasteur Indochine* no. 19 pp. 313–329, 6 pls. (1 col.), 18 refs. Saigon, April 1934. [Recd. September 1935.]

A detailed account is given of an investigation on the Staphylinids causing vesicating lesions in man in Tonkin, and on the nature of the fluid secreted and its effect on laboratory animals.

The following is largely taken from the authors' conclusions: Vesicular dermatitis in Tonkin is usually caused by *Paederus fuscipes*, Curt., and *P. alternans*, Wlk. These beetles, which are apparently widely distributed in Tonkin and have been taken in Laos and Annam, are present throughout the year. The flights during which they enter houses and are troublesome to man occur only between May and September; at other times they are found in their natural breeding

places along the edges of pools or partly flooded rice-fields, etc. [*cf.* *R.A.E.*, B **22** 168]. The lesions are caused by the action of the body fluids on the skin when the beetles are crushed. In man the reaction is not serious and is limited to the epidermis, but when suspensions made from the bodies of living or dried beetles were dropped on sensitive parts of the skin of laboratory animals, considerable destruction of tissue occurred, and when they were inoculated in various ways in relatively low concentrations, the animals died of acute nephritis. The toxic agent, which from chemical analyses appears to be cantharidin, is present in varying proportions in all parts of the beetle.

RAYNAL (J.). **Contribution à l'étude des phlébotomes d'Indochine. Généralités.**—*Arch. Inst. Pasteur Indochine* no. 19 pp. 337–369, 10 pls., 11 pp. refs. Saigon, April 1934. [Recd. September 1935.]

In this preliminary paper the author discusses the general characters of sandflies of the genus *Phlebotomus*, their collection, mounting, diagnostic characters and taxonomy.

GIORDANO (Prof. M.) & GIORDANO (Dr. M.). **La febbre esantematica del Littorale Mediterraneo in Tripolitania.** [Boutonneuse Fever in Tripolitania.]—*Arch. ital. Sci. med. colon.* **16** no. 3 pp. 101–185, 1 map, 7 refs. Modena, 1st March 1935. (With Summaries in French, English & German.)

This is a review of data on eruptive (boutonneuse) fever in Tripolitania, where 20 cases have been recorded between 1913 and 1934. The sera of several of the patients were tested, but in only one instance was the Weil-Felix reaction positive, and this is considered probably a case of typhus (Brill's disease). A positive reaction was obtained in some tests with sera of dogs from places where the disease had occurred. Intraperitoneal inoculation into a guineapig and a rabbit of brains of rats (*Mus rattus*) caught in the house of a patient produced slight fever, subcutaneous nodules and slight ulcerations. The subcutaneous injection into a rabbit of an emulsion of ticks (*Rhipicephalus sanguineus*, Latr.) taken from a dog in the dwelling of another patient gave negative results, but a similar injection of *Hippobosca capensis*, Olf., from the same dog, produced fever and diarrhoea in another rabbit. This Hippoboscid is regarded as a possible vector, as it was common in the house and the disease occurred at a season unfavourable to ticks.

SPOON (W.). **Derrispoeder tegen de runderhorzel en tegen ongedierte bij hond en kat.** [Derris Dust against *Hypoderma* and against Vermin on Dog and Cat.]—*Ber. HandMus. kolon. Inst. Amst.* no. 95, 12 pp., 1 fig. Amsterdam, 1935. (Repr. from *De Indische Mercuur*, 17th April 1935.)

Much of this information on experiments with derris dust and rotenone in Holland has already been noticed [*R.A.E.*, B **22** 152 ; **23** 145].

In tests against *Hypoderma*, the backs of the cattle were washed with a very dilute, unfiltered suspension of derris powder in water. Satisfactory results were obtained with 1 lb. of a powder containing 2 per cent. rotenone in 1 gal. water, and with $\frac{1}{3}$ lb. of one containing 8 per cent. ; $\frac{1}{4}$ lb. of the latter would probably have been effective. Pure rotenone, dissolved in acetone and diluted with water containing a

little soap, was quite satisfactory, but the derris suspension is easier to prepare. No harm was done to the cattle.

In rooms infested by the cat flea [*Ctenocephalides felis*, Bch.] derris dust applied in the evening and swept up in the following morning appeared to be effective.

PARKER (R. R.). **Rocky Mountain Spotted Fever. Epidemiology with Particular Reference to Distribution and Prevalence in the Western United States.**—*Northw. Med.* **34** no. 4 p. 111 (reprint 11 pp.), 6 charts, 9 maps, 11 refs. Seattle, Wash., April 1935. [Recd. October 1935.]

The author discusses the incidence of Rocky Mountain spotted fever in the United States, particularly the Rocky Mountain region, and examines various hypotheses that might account for its present extensive distribution. If the disease was not introduced into the eastern States from the west, then the most likely explanation of its presence there is that the virus has existed in nature for an indefinite period, possibly in the tick populations and possibly also in a low state of virulence that does not normally produce easily recognisable cases of infection [*cf. R.A.E.*, B **21** 238].

PESSÔA (S. B.) & HORTA (C. L.). **Nota sobre a evolução de algumas especies de pulgas em São Paulo.** [A Note on the Development of some Species of Fleas in São Paulo.]—*Ann. paulist. Med. Cirurg.* **25** reprint 4 pp., 1 pl. S. Paulo, May 1933. [Recd. September 1935.]

In observations at São Paulo, Brazil, the durations of the egg, larval and pupal stages in days for *Xenopsylla brasiliensis*, Baker, were 2–5, 20–22, 4–8 in summer, and 7–8, 32–34, 25–30 in winter. The corresponding figures for *X. cheopis*, Roths., were 2–5, 22–26, 4–8, and 7–8, 34–36, 25–30, and for *Ctenocephalides felis*, Bch., 2–4, 20–22, 4, and 7–8, 26–30, with no winter record for the pupal stage. Adults of the three species lived 26–35, 28–39 and 26–30 days, respectively, in summer. In winter the adults of *X. brasiliensis* lived 64–72 days and those of *X. cheopis* 66–74, no record being obtained for *C. felis*.

MEIRA (J. A.). **Contribuição parasitologica para a epidemiologia da peste bubonica na cidade de São Paulo. Sobre as pulgas de rato na mesma cidade.** [A parasitological Contribution relating to the Epidemiology of Bubonic Plague in the City of São Paulo. On the Rat-fleas in the City.]—*Ann. paulist. Med. Cirurg.* **28** reprint 51 pp., 13 graphs., 21 refs. S. Paulo, August 1934. (With a Summary in English.) [Recd. September 1935.]

This study is a continuation of previous ones on rat-fleas in the city of São Paulo [*R.A.E.*, B **20** 148; **21** 10]. The following is largely taken from the summary: The material consisted of 1,404 rats captured in almost every quarter of the city from 16th June 1931 to 17th June 1932, 959 in warehouses and 445 in dwellings or their surroundings. Fleas were found on 74 per cent. of the rats, of which the most infested species were *Mus* (*Epimys*) *rattus* and *M. r. alexandrinus*. Of the total number of fleas, 11,467 were taken on rats from warehouses and 1,967 on rats from dwellings. The proportion of males

to females was as 10 to 10·28. The fleas were *Xenopsylla brasiliensis*, Baker, *X. cheopis*, Roths., *Leptopsylla segnis*, Schönh. (*Ctenopsylla musculi*, Dugès), *Ceratophyllus fasciatus*, Bosc, *Ctenocephalides felis*, Bch., *Pulex irritans*, L., *Synosternus pallidus*, Tasch., and *Rhopalopsyllus occidentalis*, Almeida Cunha.

The flea index per rat was 4·42 in rats from dwellings and 11·95 in those from warehouses, the respective maxima being 16·142 (in December) and 17·821 (in July). The most heavily infested rat was a female of *M. norvegicus* that yielded 146 males and 129 females of *X. brasiliensis*. The annual percentages (in warehouses and dwellings) in the three most numerous species were 45·3 for *X. brasiliensis*, 33·7 for *L. segnis*, and 19·4 for *X. cheopis*. *X. brasiliensis* predominated from December to June and *L. segnis* from July to November, except in September when *X. brasiliensis* was equally numerous. Tables and graphs show the monthly variations in percentages, the different indices, and the influence of temperature and relative humidity. *X. cheopis*, the most important vector of plague, represented 21·67 per cent. of the fleas from *M.* (*E.*) *norvegicus*, 17·98 from *M. rattus*, 17·21 from *M. r. alexandrinus*, and 14·12 from mice (*M. musculus*). From 1928 to 1932 the majority of cases of bubonic plague occurred in São Paulo in summer (December to March). It was in this season that the figures were highest for percentage of rats infested with fleas, flea indices, number of fleas on a single host, *X. cheopis* index, percentages of *X. cheopis* on *M. rattus*, *M. r. alexandrinus* and *M. musculus*, predominance of *X. brasiliensis*, and concordance of indices of *X. cheopis* and *X. brasiliensis*.

Of 64 Murids parasitised by *Tunga caecata*, Enderl., 31 were taken in dwellings and 33 in warehouses. *M. norvegicus* was the preferred host.

Pessôa (S. B.). **Infestação natural da pulga do rato** *Ctenopsyllus musculi* **pelo Cysticercoide da** *Hymenolepis diminuta*. [Natural Infestation of the Rat-flea, *Leptopsylla segnis*, by *H. diminuta*.]—*Folia clin. biol.* **7** no. 3 pp. 101–102, 2 figs., 4 refs. S. Paulo, 1935.

Among about a thousand examples of *Leptopsylla segnis*, Schönh. (*Ctenopsylla musculi*, Dugès) from rats in the city of São Paulo, one contained a cysticercoid probably of *Hymenolepis diminuta*. It was not found in thousands of *Xenopsylla cheopis*, Roths, *X. brasiliensis*, Baker, or *Ceratophyllus fasciatus*, Bosc. As Meira has stated that about 54 per cent. of the rats in São Paulo harboured *H. diminuta*, it is concluded that rats acquire the infestation by ingesting intermediate hosts other than fleas. *H. diminuta* is fairly common in man in São Paulo; in one instance 16 out of 2,700 persons (0·59 per cent.) were parasitised by it.

Jorge (R.). **La peste africaine. Rapport présentée au Comité permanent de l'Office International d'Hygiène publique.**—*Bull. Off. int. Hyg. publ.* **27** no. 9 Suppl., 67 pp., 2 fldg maps, many refs. Paris, 1935.

This report has been compiled from published and unpublished data from all available sources with a view to obtaining a general idea of the plague situation on the Continent of Africa. The first chapter deals with the history of plague in Africa up to the middle of the nineteenth century and its subsequent extinction, and the second with the history of the present pandemic from its inception in 1899–1900 up to 1934,

showing its distribution and the number of cases that have occurred in the different territories in recent years. In the third chapter, accounts are given of the rodents and fleas that act as reservoirs and vectors in the various regions, of plague among wild rodents, of infection in man obtained from rats and from man by means of fleas, and of the part played in transmission by fleas living apart from their hosts. In the fourth chapter the types of plague and the effect of seasonal, racial and social influences on incidence are discussed, and in the fifth the measures of control, including vaccination and the destruction of rats and fleas are surveyed. It is concluded that, as a result of spontaneous retrogression and the continued application of prophylactic measures, the disease is gradually disappearing from Africa.

NAJERA ANGULO (L.). **Las leishmaniosis visceral y cutanea y su importancia en España.** [Visceral and cutaneous Leishmaniases and their Importance in Spain.]—*Med. Países cálidos* **8** no. 9 pp. 421–444, 3 maps, 111 refs. Madrid, September 1935.

In this survey of the distribution of Mediterranean visceral leishmaniasis and oriental sore in Spain, the author also includes records of the distribution of the species of *Phlebotomus* known in that country, namely, *P. papatasii*, Scop., *P. perniciosus*, Newst., *P. sergenti*, Parr., *P. parroti*, Adl. & Thdr., and *P. ariasi*, Tonnoir. One or more of these sandflies occur in most, but not all, of the areas where visceral leishmaniasis has been recorded.

[ZASUKHIN (D. N.).] **Засухин (Д. Н.). Ticks and the Problem of the Control of the Piroplasmosis of Horses. 2nd Edn.** [*In Russian.*]—Demy 8vo, 159 pp., 45 figs., 5 refs. Saratov, Sarat. Gos. Izd., 1935. Price 3 *rub.*

This handbook is an amplified edition of a work dealing with the classification, ecology and distribution of the ticks occurring in the Lower Volga Region and Western Kazakstan, with particular attention to the part they play in transmitting various forms of piroplasmosis of horses, which cause heavy annual losses. A list of the 18 species of ticks found up to October 1933, showing their local distribution and hosts, is followed by notes on the bionomics of the more important species, of which those attacking horses are *Hyalomma volgense*, Sch. & Schl., *Ixodes ricinus*, L., *Dermacentor silvarum*, Olen., and *D. niveus*, Neum. Of these, only the two species of *Dermacentor* undoubtedly transmit the causal organisms of equine piroplasmosis, namely *Nuttallia minor* (a piroplasm recently described from the Lower Volga Region), *N. equi*, and *Piroplasma caballi*. The adults of *D. silvarum* are the chief vectors of all these piroplasms in the northern and central districts, and those of *D. niveus* in the southern ones along the coast of the Caspian. Further sections of the work deal with the following points : the interrelation between ticks and their hosts, and their importance in relation to disease ; the forms of piroplasmosis of horses in the Lower Volga Region (with an account of the morphology of *P. caballi*, *N. minor* and *N. equi*) ; the treatment of these diseases ; the cycle of development of *Piroplasma* in ticks ; and control measures. These include the collection of ticks on horses ; arsenical dips and sprays ; the destruction of weeds that shelter the ticks ; keeping horses in stables ; periodically changing the grazing grounds ; and destroying rodents that are hosts of the larvae and nymphs of ticks.

Keys to the families of ticks and the 6 Russian genera of Ixodids [*R.A.E.*, B **22** 254] are reproduced, and the following papers are appended : Questions relating to the Clinical Aspects and Treatment of equine Piroplasmosis, by N. N. Ozerskiĭ (pp. 114–139) ; The Pathological Anatomy of the Piroplasmoses of Horses, by N. A. Borodulina (pp. 139–145) ; Instructions for the Preparation of Blood Smears and their Analysis on the Presence of Blood Parasites, by D. N. Zasukhin (pp. 145–148) ; and The Biological Foundations of the Prophylaxis and Control of Murid Rodents, by B. K. Fenyuk (pp. 148–158).

REICHENOW (E.). **Uebertragensweise und Entwicklung der Piroplasmen.** [Transmission and Development of Piroplasms.]—*Zbl. Bakt.* (1. Orig.) **135** no. 1–3 pp. 108–119, 23 refs. Jena, 1st October 1935.

This address, which is a survey from the literature of the method of transmission and the development of piroplasms, includes a table showing the various piroplasms and the ticks known to transmit them.

BOVINGDON (H. H. S.). **The Bed-bug.** (*Cimex lectularius* **L.**) **Fam. Cimicidae.**—*Rochester Nat.* N.S. **1** no. 1 pp. 3–6, 11, 4 refs. Rochester, 1935. Price 3*d*.

Notes are given on the morphology and bionomics of *Cimex lectularius*, L., and on the measures employed for its control in Britain [*cf. R.A.E.*, B **23** 141, etc.]. For the fumigation of furniture, the use of portable gas-tight vans has been found efficient. These are heated to 25–30°C. [77–86°F.], and the furniture exposed to hydrocyanic acid gas at the rate of $\frac{5}{6}$ lb. per 1,000 cu. ft. for two hours. Recent experiments have shown that the quantities of HCN per 1,000 cu. ft. necessary to kill exposed bugs in one and two hours respectively are 10·8 and 2·9 oz. at 15°C. [59°F.], 5·1 and 1·1 at 25°C., and 0·9 and 0·6 at 35°C. [95°F.]. The higher dosages used in practical fumigation are to ensure lethal concentrations of the gas in places in which the bugs may secrete themselves. The adults and nymphs of the 4th and 5th instars are more resistant than the earlier instars, but the eggs are very susceptible.

PERRY (H. M.) & POOLE (L. T.). **A common Caterpillar injurious to Man.**—*J. R. Army med. Cps* **65** no. 4 pp. 217–220, 1 pl., 3 figs., 1 ref. London, October 1935.

In the cases described, lesions varying from an urticaria to a vesicular rash resulted from contact with the caterpillars of *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.) or their hairs. Experiments showed that the long and short hairs and also the hairs adhering to the web of the cocoon produce similar lesions.

JAMES (J. F.). **Fumigation and Trapping of Mosquitoes.**—*J. R. Army med. Cps* **65** no. 4 pp. 267–269. London, October 1935.

The method of trapping described in this paper was based on the observation that mosquitos immediately left through open door and windows when pyrethrum was burned in a room. The trap consists of a piece of black cloth 6 ft. square, round the centre of which is sewn a thin muslin bag 6 ft. long by 2 ft. in diameter. The cloth is stretched on the wall over a window by means of tapes and nails, and the bag is put

through the window and attached to the posts of the verandah or other available support. The doors and other windows of the room are closed and curtained, so that the only light comes through a hole cut in the black cloth and leading into the bag. The room is then fumigated, and the mosquitos flying towards the only source of light are caught in the bag. Comparative tests using such fumigants as cresol, sulphur, pyrethrum, etc., showed that pyrethrum, preferably in the form of one of the proprietary mosquito coils, is much the most satisfactory, 3–4 inches of such a coil being sufficient to clear a barrack of 10,000 sq. ft. in half an hour at a cost of about a farthing. About 15,000 Anophelines, of which perhaps two-thirds were malaria vectors, were caught between 28th September and 5th December in barracks in India occupied by about 2,000 troops.

Balfour (M. C.). **Malaria Studies in Greece. Measurements of Malaria, 1930–1933.**—*Amer. J. trop. Med.* **15** no. 3 pp. 301–330, 2 figs., 6 refs. Baltimore, Md, May 1935. [Recd. November 1935.]

In the course of this paper on the annual fluctuations of malaria in Greece in recent years, the author briefly mentions the seasonal prevalence of the three important vectors [*cf. R.A.E.*, B **21** 167] and points out that the greater prevalence of *Anopheles superpictus*, Grassi, which is most abundant in August and September, may explain why the seasonal wave of malaria in Greece is longer and continues later in the year than in other European countries.

Hinman (E. H.). **Studies on the Dog Heartworm,** *Dirofilaria immitis*, **with Special Reference to Filarial Periodicity.**—*Amer. J. trop. Med.* **15** no. 3 pp. 371–383, 1 graph, 16 refs. Baltimore, Md, May 1935. [Recd. November 1935.]

In the course of this paper on *Filaria* (*Dirofilaria*) *immitis* in dogs in Louisiana, the author gives a brief account of further experiments [*cf. R.A.E.*, B **21** 174] on the possible chemotactic effects of the salivary secretion of mosquitos on the embryos. The mosquitos used were *Aëdes aegypti*, L., *A. sollicitans*, Wlk., and *Culex salinarius*, Coq. Extracts of the glands corresponding in amount to those of 1–4 mosquitos were injected subcutaneously into the ear of an infected dog, but counts of the microfilariae in 20 cc. of blood made before and after revealed no increase in their numbers. Similar results were obtained when counts were made before and after the feeding of several mosquitos, and when the numbers of microfilariae in the blood ingested by a mosquito were compared with the numbers in a similar quantity of the peripheral blood of the dog on which it had fed. Large numbers of *A. aegypti* fed in groups of 20–30 on a heavily infected dog failed to transmit the parasite when fed repeatedly on healthy dogs at intervals after an incubation period of 10 days, although dissections of mosquitos from the various batches revealed active larvae in the malpighian tubes and later in the head. The large numbers of microfilariae ingested by each mosquito and the large number of infected mosquitos fed on each dog should have provided ample opportunity for infection. It is pointed out that the presence of mature larvae in an insect and their migration to the proboscis may not indicate the ability of the insect to transmit the parasite.

Boyd (M. F.), Cain, jr. (T. L.) & Mulrennan (J. A.). **The Insectary rearing of** *Anopheles quadrimaculatus*.—*Amer. J. trop. Med.* **15** no. 3 pp. 385–402, 7 figs., 3 refs. Baltimore, Md, May 1935. [Recd. November 1935.]

A detailed description with plans is given of an outdoor insectary in Florida [*cf. R.A.E.*, B **21** 36, 150] and an indoor insectary in New York City in which colonies of *Anopheles quadrimaculatus*, Say, are being successfully reared. The colony in Florida has been continuously maintained for nearly three years, and the methods, which were based on studies made in North Carolina [*cf.* **18** 230; etc.], have been successfully adapted to the artificial environment of an indoor installation in New York. The outdoor unit consists of a large cage (entered by a screened and curtained vestibule) in which the adults live. This contains a tank operated as a balanced aquarium, in which eggs are laid, and a water-bath, in which the pans of larvae are kept at a constant temperature of 70°F. The pan containing pupae, over which is a cone-shaped emergence cage, is kept in the water-bath in winter and in a cool dark place in summer. The floor beneath the tank is covered with sand kept saturated with water so as to provide a cool damp shelter for the adults in summer; in winter they usually concentrate on the walls and ceiling. The indoor unit is similar, except that the cage is in a room in which a constant temperature of 72°F. is maintained by an air-conditioning apparatus and the water-bath, which here requires no heating or cooling, is outside the cage. As all windows must be kept closed for satisfactory air conditioning, a sunlamp supplies the ultra-violet rays that are believed to be essential to proper larval development. The room is ventilated by a transom in the wall opening into a screened vestibule, an average relative humidity of 70 per cent. is maintained by water vapour from the hot water tap, and the air is kept in continuous circulation by a fan.

The routine insectary operations are described. When the ova are collected from the aquarium, some are stored on damp filter papers in jars in a refrigerator for a fortnight in case of accidents, after which they are returned to the insectary for incubation. The infusoria that develop in a ripened hay infusion, supplemented by yeast, form an almost ideal food for the larvae; the methods of preparing and ripening such infusions are described. They should ripen for at least 30 days in summer and more in winter. The water remains acid until the cessation of carbohydrate fermentation, when it becomes neutral and finally alkaline. For the larvae of both *A. quadrimaculatus* and *A. punctipennis*, Say [*cf.* **22** 163], alkalinity is required, but for those of *A. crucians*, Wied., the water should be used while in the acid phase, which can be prolonged by the addition from time to time of small amounts of sugar. The infusions should be discarded after they have been in use for 30–40 days in Florida or 15–30 days in New York. The pans are 12 inches in diameter and 2½ inches deep. One cake of Fleischmann's yeast is sufficient for 10 pans and will last for 24 hours when about 400 larvae are kept in each. It is advisable to omit the yeast during the first 36 hours after larvae have been added to a new pan. In New York narrow strips of cork and ground cork as floatage to secure uniform distribution of the larvae and pupae respectively have had to be substituted for the chaff successfully used in Florida. The water in the emergence pan should be changed daily to prevent the formation of a film, which will kill the pupae.

The technique used to separate the females needed for experimental purposes from the males is described. These females are kept in an incubator at 20°C. [68°F.] for two or three days until they have been fed on dextrose (a procedure that has been found to increase their longevity) and are then stored in a cage holding approximately 300 in a refrigerator. They feed best if used 7–10 days after emergence and after 2 days of starvation. Dextrose solution may be substituted for raisins as a food for the males. In Florida the density in the cage is maintained at 3,000 adults in summer and 5,000 in winter, the larger number being kept to compensate for the higher mortality and diminished feeding and oviposition in the latter season.

The adaptation of this strain of *A. quadrimaculatus* to an artificial environment probably accounts for the recent successful establishment of a separate colony in a small cage 30 inches square by 36 inches in height. Pairing occurs, and the colony has already been maintained for three generations.

HUFF (C. G.). **Natural Immunity and Susceptibility of Culicine Mosquitoes to Avian Malaria.**—*Amer. J. trop. Med.* **15** no. 4 pp. 427–434, 1 fig., 12 refs. Baltimore, Md, July 1935.

The author reviews his work on variations in susceptibility among different species of Culicine mosquitos and among individuals of the same species, particularly *Culex pipiens*, L., to infection with the parasites of avian malaria [*cf. R.A.E.*, B **16** 61 ; **18** 96 ; **19** 7, 249 ; **22** 48] and concludes that heredity must be considered in attempts to explain the complexities of malarial epidemiology.

WHEELER (C. M.). **A new Species of Tick which is a Vector of Relapsing Fever in California.**—*Amer. J. trop. Med.* **15** no. 4 pp. 435–438, 1 ref. Baltimore, Md, July 1935.

A full description is given of the female of *Ornithodorus hermsi*, sp. n., together with a note on the male. The characters distinguishing this species from others of the genus found in California were given in a paper already noticed [*cf. R.A.E.*, B **23** 221].

BOYD (M. F.), STRATMAN-THOMAS (W. K.) & KITCHEN (S. F.). **On the Relative Susceptibility of** *Anopheles quadrimaculatus* **to** *Plasmodium vivax* **and** *Plasmodium falciparum*.—*Amer. J. trop. Med.* **15** no. 4 pp. 485–493, 3 refs. Baltimore, Md, July 1935.

Data on the susceptibility of *Anopheles quadrimaculatus*, Say, to infection with *Plasmodium vivax* and *P. falciparum*, obtained in the course of routine propagation of parasites for the purposes of malaria therapy, are discussed.

The following is largely taken from the authors' summary: A definite proportion of a large series of mosquitos appears to be refractory to each species of parasite, and the data, judged by the proportion of mosquitos becoming infected and by the intensity of their infection, suggest that *A. quadrimaculatus* is a less efficient host for *P. falciparum* than for *P. vivax*. On the other hand, when the gametocyte density is sufficiently high, it is infected to almost the same degree by both parasites, and the authors consider that the differences noted should be attributed to characteristics of the parasites themselves rather than to

a variation in the susceptibility of the mosquito. For practical purposes the minimum parasite density necessary for the infection of *A. quadrimaculatus* with *P. vivax* is one male and one female per 100 leucocytes and with *P. falciparum* 11 males and 11 females.

STAGE (H. H.) & GJULLIN (C. M.). **Anophelines and Malaria in the Pacific Northwest.**—*Northw. Sci.* **9** no. 3 reprint 7 pp., 1 graph, 16 refs. *Sine loco*, September 1935.

In this paper, which is largely devoted to a discussion of the past history and present status of malaria in the States of Washington and Oregon, a certain amount of information is given on the habits and seasonal prevalence of *Anopheles maculipennis*, Mg., and *A. punctipennis*, Say, the only Anophelines found in collections made over a period of five years. Although both species were taken in the late summer over most of the area, *A. punctipennis* appeared to be the more numerous. Neither species showed any decided preference for a particular type of water for breeding. Larvae have been taken from spring and seepage water in unshaded and partly shaded situations, from semi-permanent roadside ditches containing rain, irrigation or river water, from the margins of streams, and from the grassy edges of large permanent ponds and small lakes. The most common plants in the breeding places were *Sagittaria latifolia* and species of *Spirodela*, *Typha*, *Myriophyllum*, *Eleocharis*, *Carex*, *Scirpus* and *Juncus*. The pH in breeding places over a wide range of conditions and country varied from 6·1 to 8·1, but in most cases was between 6·5 and 7·7. In the Willamette Valley, Oregon, adults were easily found on the ceilings and in darkened protected corners of outbuildings. In the field in late summer they were found sheltering from the sun and wind under leaning and fallen tree trunks near the ground. As the temperature is lower and the season shorter on the east than on the west of the Cascade Range, it is suggested that two or three generations of Anophelines may occur on the eastern side and four or even five in the Willamette Valley on the western side. On the eastern side development ceases early in September, whereas on the western side it continues until late in October. The conditions under which Anophelines may be found in the Pacific Northwest vary greatly, since they have been taken from the sea coast to high inland mountains and from fertile, well-tilled valleys to arid desert.

A study of 243 malaria cases recorded in Oregon from 1920 to 1934 inclusive indicates that there are four peaks in the seasonal incidence : in the second week in June, the third in July, the first in September (which is by far the highest) and the second in October.

HU (S. M. K.). **Studies on the Susceptibility of Shanghai Mosquitoes to Experimental Infection with** *Wuchereria bancrofti* **Cobbold. III.** *Culex tritaeniorhynchus* **Giles.**—*Peking nat. Hist. Bull.* **10** pt. 1 pp. 39–43, 3 refs. Peiping, September 1935.

In 1933 and 1934, experiments similar to those already noticed [*cf.* *R.A.E.*, B **23** 213] were carried out in Shanghai to test the susceptibility of reared adults of *Culex tritaeniorhynchus*, Giles, to infection with *Filaria* (*Wuchereria*) *bancrofti*. Of 181 examples fed on a heavily infected person, 97 harboured filarial larvae when dissected after an incubation period of more than 10 days. In most of them, however,

the larvae had not developed much beyond the intermediate sausage form and in only 4 had they reached the infective stage. Dissection of 14 mosquitos of this species taken in houses in the Woosung area during the summer of 1933 revealed no infections. It seems probable, therefore, that it plays only a minor part in the transmission of filariasis in this region, especially as it is not so numerous in houses as other species that are more susceptible to infection.

Kraan (H.), de Buck (A.) & Swellengrebel (N. H.). **On the Fat and Water Content of hibernating** *Anopheles maculipennis* **var.** *atroparvus* **and var.** *messeae* **in Holland.**—*Riv. Malariol* **14** (1) no. 3 pp. 201–213, 3 refs. Rome, 1935. (With a Summary in Italian.)

In Holland females of *Anopheles maculipennis* var. *messeae*, Flni., are distinguished from those of *A. maculipennis* var. *atroparvus*, van Thiel, during the earlier months of hibernation (September and October) by the abdomen being distended by a hydropic adipose body [*R.A.E.*, B **16** 242]. The present paper describes investigations made to ascertain if such " fat " mosquitos contain more of a substance removable by extraction with ether [*cf.* **23** 198] than those classified as " lean." The conditions found in these races in October and in February are recorded, together with some comparative observations on hibernating *Culex pipiens*, L.

The following is taken from the summary : In autumn both *messeae* and *atroparvus* carry fat in their fat-body, but there is more fat and water in the " fat " mosquitos than in the " lean " ones. In some years, at least, fat individuals may be found in equal numbers among *messeae* and *atroparvus*, but in October fat *messeae* females contain more fat and water than fat *atroparvus*. In *atroparvus* " growing lean " is a rapid process with loss of fat and water in equal proportions ; in *messeae* it is a slow process, better termed dehydration, as the loss of fat is slight compared with that of water. By feeding, *atroparvus* replenishes its stock of fat and water and must do so or die in hibernation, whereas *messeae* does not feed. In *messeae* fatness is a lasting condition ; in *atroparvus* it is not.

By the end of the hibernation period (latter half of February) *atroparvus* is in about the same condition as in autumn, except for some disturbance in the water-fat balance. It is rapidly making up the losses sustained during the two months of reduced blood-meals, and as a consequence the " fat " individuals are really fat. Unlike *atroparvus*, " lean " *messeae* has not yet begun to repair the losses sustained during six months of complete hibernation and it is really lean, the loss of fat greatly exceeding the loss of water. By showing that " growing lean " in *messeae* in autumn primarily means dehydration, fat-analysis has explained the fact that a lean *messeae* had apparently lost its surplus of fat by November or December, when true winter was approaching. Observations on *C. pipiens* support this explanation.

de Mello (F.) & Brás de Sá (L. J.). **Ne pourra-t-on faire revivre la " Vieille Gôa " ? (Une page intéressante de Malariologie : le paludisme des ruines et des villes mortes.)**—*Riv. Malariol.* **14** (1) no. 3 pp. 273–291, 2 maps. Rome, 1935.

The ruined town of Old Goa has now less than 100 inhabitants but is visited by numerous pilgrims to the tomb of St. Francis Xavier.

Malaria is rife, there being a splenic index of 60 per cent. and a parasite index of 53·1 per cent., *Plasmodium falciparum* being the predominant form.

The Anophelines observed during the dry season were *Anopheles fluviatilis*, James (*listoni*, List.), *A. barbirostris*, Wulp, *A. jamesi*, Theo., *A. vagus*, Dön., and *A. subpictus*, Grassi. At the end of the rainy season *A. varuna*, Iyen., *A. minimus*, Theo. (which was rare) and *A. hyrcanus* var. *nigerrimus*, Giles, were also found. Of these *A. fluviatilis*, *A. varuna* and *A. minimus* are recognised as important vectors of malaria in India. Adults of *A. fluviatilis* were observed indoors even by day, and the larvae occurred in disused or little used wells, with bushes growing on their sides, in pits with clear water and vegetation, and in two open-air reservoirs. Their distribution and abundance in these breeding places varied in the different months, and in the rainy season they also occurred in puddles. *A. varuna* had the same breeding places, and neither of these Anophelines was found in streams that were apparently quite suitable for it.

ZAVATTARI (E.). **Modello di lettino a zanzariera per i paesi tropicali.** [A Camp Bed with Mosquito Net for tropical Countries.]—*Riv. Malariol.* **14** (1) no. 3 pp. 292–296, 3 figs. Rome, 1935. (With a Summary in English.)

The author describes a camp bed and mosquito net for it. All the supports of both can be detached into pieces not more than 28 inches long. The net is hung from a horizontal rod supported by two vertical ones fixed to the end-pieces of the bed.

[HACKETT (L. W.) & BARBER (M. A.).] **Хакетт (Л. В.) и Барбер (М. А.). Notes on the Varieties of** *Anopheles maculipennis* **in the USSR.** [*In Russian.*]—*Med. Parasit.* **4** no. 3 pp. 188–199, 11 figs., 1 ref. Moscow, 1935. (With a Summary in English.)

An account is given of brief investigations carried out in July and August 1934 in the Volga basin and the Caucasus and along the northern coast of the Black Sea on the occurrence of races of *Anopheles maculipennis*, Mg. [*cf. R.A.E.*, B **23** 108]. The technique of collecting the eggs or obtaining them from captured females, and of preserving and mailing them is described ; tables show the types of eggs examined, the dates, the localities and characteristics of the places where the mosquitos or eggs were taken, and the types of day-time shelters of the mosquitos. The typical race was almost the only one present in the Caucasus and predominated on the Black Sea coast from Batum to Sebastopol ; it occurred together with *messeae*, Flni., in the Moscow region and in the hilly country on the right high bank of the Volga near Saratov. Though eggs of the typical race were common in accumulations of water on islands on the Volga and in its delta, and in the steppes in the Republic of the Volga Germans, no adults were found there. The only other race that occurred in numbers was *messeae*, which was almost the only one present in the steppes east of Saratov, in the delta of the Volga and in a peat-bog locality near Moscow, and was dominant in the valley of the upper Volga, but was rare in the Caucasus. A single individual of *A. sacharovi*, Favr (*elutus*, Edw.), which is treated as a race of *A. maculipennis*, was taken (in the south-east of Daghestan) ; *atroparvus*, van Thiel, only occurred in a small area on the Black Sea coast between Odessa and the Dnieper, where it was

dominant; *labranchiae*, Flni., was not found at all; and *melanoon*, Hackett, was represented by one batch of eggs only.

Eggs similar in structure to those of *messeae*, but with dark patternless ends, constituted almost half of the egg-batches collected in the Volga basin; and eggs of the typical race, but having small floats that resembled those of *labranchiae* and in some instances were almost smooth, were found or obtained from females in various parts of the Caucasus.

Precipitin tests showed that in certain areas both *messeae* and the typical *maculipennis* enter houses to bite man, though in small numbers only and chiefly in the absence of animal quarters.

[MURATOVA (A. P.), POKROVSKIĬ (S. V.), SHETVINA (A. A.) & ARKINA (E. V.).] **Муратова (А. П.), Покровский (С. В.), Шетвина (А. А.) и Аркина (Е. В.). Observations sur l'*Anopheles maculipennis* dans le Département de Moscou.** [*In Russian.*]—*Med. Parasit.* **4** no. 3 pp. 200–205, 15 refs. Moscow, 1935.

In the course of investigations on *Anopheles maculipennis*, Mg., in a number of malarious districts in the Moscow region in 1932 and 1933, over 2,000 females were dissected at various times and examined for malaria parasites. None of those taken in hibernation quarters or in the spring and summer in cow-sheds was infected. Of those taken in inhabited houses, 0·87 per cent. were infected. The infected mosquitos were only found in August and the first half of September.

The ovaries of hibernating females were always immature, and only began to develop after the mosquitos had left their hibernation quarters and taken a blood meal. In tests carried out from mid-September to about the end of December, females from hibernation quarters were kept at 19°C. [66·2°F.]. The percentages that oviposited were 32, 40, 12, 8 and 6 after 1, 2, 3, 4 and 6 blood meals respectively. One female only oviposited after 8 meals. The maximum number of eggs from a female was 1,355 laid in 10 batches during 68 days. On an average, oviposition occurred 10·4 days after the first meal, and the intervals between separate ovipositions averaged 6·5 days. A few females taken in cow-sheds in mid-June with undeveloped or semi-developed ovaries were found to contain 1 or 2 completely mature eggs, which had probably remained from the first oviposition. This indicates that overwintered females oviposit, and therefore feed, at least twice, a fact that increases the risk of their transmitting malaria. The hibernating mosquitos chiefly occurred in basements and storerooms, but the numbers found were very small, probably because the weather had been unfavourable in the autumn of 1932. In the spring, the mosquitos began to leave their hibernation quarters between 6th and 20th April, and mass oviposition took place about the middle of May. In autumn, the winter shelters were finally entered between 5th and 9th November. In the day-time shelters, females were predominant in cow-sheds and males chiefly occurred in latrines. Thus, in mid-June, only 2·1 per cent. of the mosquitos in cow-sheds were males.

[KRIVENKO (A. I.).] **Кривенко (А. И.). Observations sur la biologie d'*Anopheles hyrcanus* Pall. en Extrême Orient.** [*In Russian.*]—*Med. Parasit.* **4** no. 3 pp. 205–207. Moscow, 1935.

In laboratory experiments in July 1930 in the Russian Far East, the egg, larval and pupal stages of *Anopheles hyrcanus*, Pall., lasted 2–3, 13

and 2–3 days respectively. In the field, development would probably last 3–4 days longer. A female laid 447 eggs in 10 days, during which it took 5 blood meals and oviposited 3 times.

Since the larvae are sometimes found in small quantities of water in mud, their resistance to desiccation was studied by placing batches of four larvae of the third and fourth instars in diluted mud on watch glasses. In 24 hours the mud had dried and cracked, and the larvae were embedded in it. One of the glasses was then placed in water, and all the larvae revived. Two died before pupating, but two, which were males, reached the adult stage. Larvae left in the dry mud for 2–3 days revived on being placed in water but died without pupating. To test the ability of the larvae to pupate among aquatic vegetation in the absence of sand or soil, in which pupation usually takes place, larvae of various instars were kept in water from their natural breeding place with a layer of filamentous algae covering the bottom of the container. All the larvae completed their development and pupated. The larvae and the pupae acquired the green colour of the algae, and the resulting adults retained a greenish shade on the abdomen and thorax.

[Beklemishev (V. N.) & Raevskiĭ (G. E.).] **Беклемишев (В. Н.) и Раевский (Г. Е.). On entomological Research concerning Malaria in provincial Institutions.** [*In Russian.*]—*Med. Parasit.* **4** no. 3 pp. 209–212, 7 refs. Moscow, 1935.

This is an outline of a programme of research to be carried out by subsidiary malaria stations in the Russian Union. It consists of two parts, the first of which contains instructions for collecting data on the seasonal occurrence of different species of *Anopheles*, the behaviour of the adults, their occurrence in day-time shelters and hibernation quarters, and the abundance of the larvae and pupae. The second part discusses the division of the country into malarious districts, the factors to be considered being the topography and climate of the localities, the composition of the Anopheline fauna, the presence of suitable breeding places, the density of the human population and its standard of life, the type of dwellings and animal quarters, and the incidence of malaria.

Conferenze sulla malaria. [Lectures on Malaria.]—*Riv. Malariol.* **14** (2) no. 3 Suppl. 96 pp. Rome, 1935.

This collection of lectures given at a course on malaria at the Istituto di Malariologia, Rome, in August 1934 includes one, " Le médecin et l'entomologie " by N. H. Swellengrebel, which shows the need for distinguishing different Anophelines and their bionomics as a preliminary to control, with particular reference to " species sanitation," and another, " Malaria Survey," by S. R. Christophers, which describes the technique of such surveys and briefly refers to the results of some Anopheline surveys in India.

Feng (L. C.). **Some Experiments with Mosquitoes and *Microfilaria malayi* in Huchow (Chekiang, China).**—*Trans. Congr. Far-East. Ass. trop. Med.* **9** 1 pp. 491–494. Nanking, 1934. (Abstr. in *Trop. Dis. Bull.* **32** no. 9 p. 647. London, September 1935.)

Experiments on the transmission of *Filaria* (*Microfilaria*) *malayi* were carried out in Huchow, Chekiang Province [*cf. R.A.E.*, B **21** 157]

in July–August 1933. Partial development took place in *Culex pipiens*, L., *Aëdes* (*Stegomyia*) *albopictus*, Skuse, and *Armigeres obturbans*, Wlk. In *Mansonia uniformis*, Theo., development was normal up to the 4th day, after which a certain number of the embryos died, and only comparatively few reached maturity 8 days after the infecting feed. In *Anopheles hyrcanus* var. *sinensis*, Wied., development was normal; the filarial embryos reached maturity on the 6th day, and from the 6th to the 8th day after the infecting feed, invasion of the labium by mature larvae was common. As many as 59 mature, actively motile larvae were found in one mosquito in various parts of the body, including the labium. It is concluded that *A. hyrcanus* var. *sinensis* is the most important vector of *F. malayi* in this area, although *M. uniformis* may also play a part in transmission.

Missiroli (A.). **Nuova varietà di** *Anopheles maculipennis*.—*Ann. Igiene* **45** no. 5 p. 333. Rome, 1935.

Most of the ovipositions by captive females of *Anopheles maculipennis* Mg., taken in Sicily round the lake of Pergusa were composed of eggs characteristic of race *labranchiae*, Flni., but in some the eggs were wider and shorter, and of a uniform grey colour with some slightly darker markings, an abundant fringe and banded floats like those of *labranchiae*, but so minute as to be almost invisible. The name *pergusae* is given to this new variety. The lake is brackish and lies at an altitude of about 2,000 ft.

[Fedorov (V. N.) & Sivolobov (V. F.).] **Федоров (В. Н.) и Сиволобов (В. Ф.). Ueber die Rolle der Stechmücken in der Epidemiologie der Tularämie.** [On the Rôle of Mosquitos in the Epidemiology of Tularaemia.] [*In Russian.*]—*Rev. Microbiol.* **14** no. 1 pp. 65–70, 11 refs. Saratov, 1935. (With a Summary in German.)

Investigations in the Russian Union have shown that epidemics of tularaemia are usually the result of some association with rodents [*cf. R.A.E.*, B **19** 85; **23** 85]. Cases that could not be explained in this way have, however, occurred in summer among persons working in water meadows, in which mosquitos were abundant. They were characterised by the presence of small ulcers on the exposed parts of the body, which suggested that the infection might have been acquired by crushing some blood-sucking insect in the act of biting. Tests were, therefore, carried out in Western Kazakstan to determine the ability of mosquitos to harbour *Bacterium tularense*. For this purpose, adults of *Anopheles maculipennis*, Mg., collected from their hibernation quarters in October were fed on a pure culture of the bacterium emulsified in 2 per cent. glucose. This was done by confining them in a glass tumbler over a petri dish on which a few drops of the emulsion were placed. By working with 5–6 tumblers simultaneously, it was possible to get about 90 mosquitos to engorge in 5–6 hours. They were then kept in muslin cages at 9–14°C. [48·2–57·2°F.]. After various intervals of time, the mosquitos were deprived of wings, legs and proboscis and suspensions prepared from them were injected subcutaneously into mice, all of which died of tularaemia within 6–8 days. The last injections, made with a suspension prepared 50 days after the mosquitos had fed, produced a fatal infection in both the mice used.

[Ioff (I.).] **Иофф (И.) Materialien zum Studien der Ectoparasitenfauna im Süd-Osten der U.d.S.S.R. VIII. Flöhe der** *Ellobius talpinus.* [Materials for the Study of the Ectoparasite Fauna of the South-east of U.S.S.R. VIII. Fleas of *E. talpinus.*] [*In Russian.*]—*Rev. Microbiol.* **14** no. 1 pp. 79–86, 4 figs., 9 refs. Saratov, 1935. (With a Summary in German.)

Brief notes are given on the bionomics of *Ellobius talpinus*, a Murid that occurs in the south-east of European Russia and has been found infected with plague [*R.A.E.*, B **19** 201], and on the dates and places of capture of fleas found on it and in its nests in 1925–30. Of 106 examples of this rodent examined, only 20 harboured fleas. Of 189 fleas from them and from 20 nests, 144 were *Xenopsylla magdalinae*, sp. n., which is described. The author considers that this species is specific to *E. talpinus* and is the one previously recorded from it as *X. mycerini*, Roths. [**19** 202]. Its similarity to *X. conformis*, Wagn., which is a specific parasite of jerboas (*Pallasiomys meridianus* and *Rhombomys opimus*) is discussed.

The other 45 fleas were *Ceratophyllus tesquorum*, Wagn., *Amphipsylla rossica*, Wagn., *Neopsylla setosa*, Wagn., *Ctenophthalmus orientalis*, Wagn., *C. breviatus*, Wagn. & Ioff, *C. pollex*, Wagn. & Ioff, and *C. gigantospalacis*, Ioff, all of which are common parasites of other rodents, and one individual of *Pulex irritans*, L., which had probably passed to the animal in the laboratory.

[Gutzevich (A. V.) & Podolyan (V. Ya.).] **Гуцевич (А. В.) и Подолян (В. Я.). Die Pyrethrum-Rauchlichter als Bekämpfungsmittel der Stechmücken und der Phlebotomen.** [Pyrethrum Smoke-candles as a Means of controlling Mosquitos and Sandflies. (*In Russian.*)]—*Rev. Microbiol.* **14** no. 1 pp. 87–98, 1 fig., 9 refs. Saratov, 1935. (With a Summary in German.)

Pyrethrum smoke-candles have been successfully used in various parts of the Russian Union for killing or repelling mosquitos and sandflies [*Phlebotomus*]. The necessary ingredients (the proportions of which may be slightly varied) are: 100 oz. pyrethrum powder (pyrethrin content 0·28 per cent.), 50 oz. semi-liquid wheat-flour paste, 25 oz. potassium nitrate, 25 oz. sawdust, and 50–70 fl. oz. water. The pyrethrum powder and sawdust, both of which must be dry and fine, are thoroughly mixed together, and a solution of the potassium nitrate in warm water, with the paste, is gradually added and stirred into the mixture. If necessary, more water may be added. The resulting mass, which should be viscous and compact, is rolled flat and cut into sticks (candles) about 1 cm. square in cross section, and the sticks are dried. Increasing the amount of potassium nitrate will make the sticks smoulder more quickly. As a protection outdoors, the candles may be carried on the person in a perforated tin tube enclosed in a large perforated tin case with a hole in the lid. If fixed to the belt, the tin should be placed in a case of fabric to prevent the clothes being scorched. To destroy mosquitos and sandflies in buildings, the candles should be used at the rate of 1–1½ oz. per 100 cu. ft. if the windows and doors are tightly closed; or 2–4 oz. per 1,000 cu. ft. to drive the mosquitos from the room into nets in the windows, where they can be collected and killed. As a repellent in tents or houses with open windows ½–2½ oz. per 1,000 cu. ft. is sufficient.

De Benedetti (A.). **Outillage mécanique pour la préparation d'une poussière flottante selon le procédé De Benedetti appliqué par le service de délarvisation de la ville de Milan.**—*Rev. Hyg. Méd. prév.* **57** no. 4 pp. 267–273, 3 figs., 4 refs. Paris, 1935.

The author describes and illustrates an apparatus designed for mixing the earth and oil to be used as a carrier for Paris green against Anopheline larvae [*cf. R.A.E.*, B **21** 180]. For heating the mixture to evaporate the excess oil, he recommends a furnace on wheels such as is used for applying asphalt, provided that the reservoir is shallow enough to permit adequate stirring and heating. He also describes a further modification of the knapsack duster [*cf.* **22** 35] in which the size of the holes in the plate forming the bottom of the dust store can be regulated by means of a screw. The modified duster is estimated to effect an economy of 40 per cent. in material and, as the dust floats on the water for 15–25 days, the interval between dustings may be increased from 8–12 to 20–25 days [*cf.* **22** 138].

Freney (M. R.), Mackerras (I. M.) & Mackerras (M. J.). **A Note on new Dressings for Fly-struck Sheep.**—*J. Coun. Sci. industr. Res. Aust.* **8** no. 3 pp. 161–168, 1 graph. Melbourne, August 1935.

A promising new Blowfly Dressing. Glycerine and Boric Acid.—*Agric. Gaz. N.S.W.* **46** pt. 7 p. 370. Sydney, 1st July 1935.

Glycero-Boric Blowfly Dressing.—*J. Dep. Agric. Vict.* **33** pt. 7 p. 349. Melbourne, July 1935.

Glycero-Boric Blowfly Dressing.—*J. Dep. Agric. S. Aust.* **38** no. 12 pp. 1497–1498. Adelaide, 15th July 1935.

In the first paper, an account is given of experiments in which various compounds containing boric acid and glycerine were tested against artificially induced blowfly strike on sheep in the laboratory. Glyceroboric acid was prepared by dissolving 61·8 gm. boric acid in 280 gm. warm glycerine ; mono-, di-, and tri-boric preparations were made by dissolving one, two and three moles (61·8, 123·6 and 185·4 gm.) of boric acid in one mole (92·1 gm.) hot glycerine, stirring and heating the mixtures to 150°C. [334°F.], and adding 228 gm., 320 gm. and 410 gm. cold glycerine respectively. These preparations are colourless, odourless, hygroscopic, somewhat viscous fluids ; they are soluble in alcohol and, although they are miscible in water, they are hydrolysed by it, a copious precipitate of boric acid being formed. They were modified by dilution with alcohols, by varying the proportions of the original constituents, by using different methods of preparation, by using borax instead of boric acid, and by using crude instead of pure glycerine in the glyceroboric acid and the di-boric preparation.

The dressings are easily rubbed in and penetrate readily to all parts of the strike, including cracks and folds ; they adhere well to the fleece, skin and wounded surface, and, because they are hydrolysed in the presence of lymph, the struck area is thoroughly impregnated with boric acid. Their consistency is satisfactory in warm weather, but in cold weather some of them are too thick and sticky ; they are pleasant to use and prevent the smell of strike from persisting on the hands. No inflammatory reaction was produced on the skin of the sheep, and its texture and flexibility were improved. There have been no indications that the preparations are toxic to sheep. Soon after the dressing was applied, the maggots became restless and ceased to worry the sheep ; many wandered down through the fleece and dropped to the ground and

the others died 6–30 hours after treatment. In none of the tests with the mono-, di- and tri-boric preparations did the maggots remain healthy long enough to produce further damage to the skin, although pockets of dying maggots were sometimes found in the fleece. Glyceroboric acid appeared to be less active, for in 4 out of 26 tests small numbers of maggots survived long enough to form pockets, in which there was definite irritation of the skin, on areas not protected from re-strike by the presence of the dressing. The other glycerine and boron compounds tested gave satisfactory results. Among full-grown maggots placed in contact with undiluted dressing for 5–60 minutes the average mortality was 93 per cent.; among those removed from sheep 5–20 minutes after the application of dressing, it was 73 per cent., and among those collected after they had dropped to the ground from dressed sheep, it was 100 per cent. In these tests the glyceroboric acid was as toxic as the other preparations, so that the reason for its relative inefficiency on sheep is not apparent.

With regard to the effect of the dressings on wounds, the usual basic odour of strike is re-placed by a much less unpleasant acidic odour, there is a rapid transudation of lymph from within outward and the general condition of the sheep rapidly improves. As the transudate immediately becomes impregnated with boric acid, there is little danger of re-strike. Within 24–48 hours, inflamed unbroken skin becomes normal, and pitted and ulcerated areas become covered with a firm clean scab. Deep pockets in the subcutaneous tissue may not be completely covered for a day or two. The scabs remain more flexible and less liable to crack, and wool growth from the healed area is satisfactory. The glyceroboric acid and the mono- and di-boric preparations are equally good and definitely better than the tri-boric preparation in these respects. Attempts to produce re-strike on treated areas at intervals of 4–40 days were unsuccessful. None of the preparations discolour or otherwise adversely affect the value of the fleece. The cost of treatment is discussed. It is estimated that with average field strikes properly treated with pure chemicals it would be about 1*d.* per sheep. As these dressings have given decidedly better results in the laboratory than any other preparations tested, particulars are given for making two of them in quantities suitable for field application. Glyceroboric acid is made by mixing 3 lb. powdered boric acid with 13 lb. (1 gal.) glycerine and heating and stirring until all the powder has dissolved. For the di-boric preparation, which is probably the best but is more difficult to make, 4 lb. powdered boric acid are gradually dissolved in 3 lb. hot glycerine, the mixture being heated to 300°F.; 10 lb. cold glycerine is then added and the mixture warmed and stirred until clear. Both preparations should be cooled and stored in air-tight bottles or tins, as the boric acid tends to separate out on exposure.

In the three other papers a brief account is given of the discovery of these preparations, with instructions for making the glyceroboric acid in quantity for field trials. The cost is estimated at 2*d.* per sheep.

BONNE (C.). **Over de Crithidien van** *Triatoma rubrofasciatus* **de Geer.**—*Geneesk. Tijdschr. Ned.-Ind.* **75** no. 17 p. 1490, 1 pl. Batavia, 20th August 1935.

A natural intestinal infection of *Triatoma rubrofasciata*, DeG., by crithidia is recorded from Java. Following injections of these flagellates, a mouse that died after 3½ days harboured trypanosomes in the

heart-blood, while another mouse had trypanosomes in the peripheral blood after 2½ days. It has already been shown that *Trypanosoma* (*Schizotrypanum*) *cruzi* probably occurs in monkeys in Java [*R.A.E.*, B **23** 160].

MULES (J. H. W.). **Crutch Strike by Blowflies in Sheep. A Preventive Operation.**—*Qd agric. J.* **44** pt. 2 pp. 237–241. Brisbane. 1st August 1935.

MACKERRAS (I. M.). **Sheep-Blowfly Investigations : Observations on the Mules Operation.**—*J. Coun. sci. industr. Res. Aust.* **8** no. 3 pp. 169–170. Melbourne, August 1935.

Sheep are rendered susceptible to blowfly attack by the wetting of the crutch with urine and the subsequent retention of such moisture. The operations described in the first paper [*cf. R.A.E.*, B **23** 160] are designed to remove all folds and wrinkles and to prevent or correct any malformations that may obstruct the clear drop of the urine to the ground.

In the second paper favourable comments are made on the operation for the removal of folds and wrinkles in the crutch as carried out on a large number of sheep in southern Queensland where an extensive trial of the method is being undertaken.

JACK (R. W.). **The Report of the Chief Entomologist for the Year ending 31st December 1934.**—*Rhod. agric. J.* **32** no. 8 pp. 558–581, 1 pl. ; also as *Bull. Minist. Agric.* [*S. Rhodesia*] no. 962, 24 pp., 1 pl. Salisbury, August 1935.

In the medical and veterinary section of this report (pp. 566–577), details are given of the situations in 1934 in localities in Southern Rhodesia where operations against tsetse fly [*Glossina morsitans*, Westw.] are in progress [*cf. R.A.E.*, B **23** 201]. In most places the position is satisfactory, and extensive areas in the more important districts have been rendered reasonably safe for domestic animals. Though the object of the work was defence rather than reclamation of infested country [**21** 222, etc.], the attempt in certain areas to put a greater distance between the fly and occupied land has resulted in about 1,900 sq. miles being cleared of it or brought to a condition in which only occasional individuals are encountered. In the Gwaai-Shangani region progress is slow owing to the high density attained by the fly before operations began and to the great attraction of this country for game. The position in the Urungwe Native Reserve is unsatisfactory. In the western half of the Reserve and thence to the Sunyati River, the country is very broken and deficient in permanent water ; it is the haunt of rhinoceros and elephant, the destruction of which is undesirable, and the creation of a wide fly-free buffer zone would be extremely difficult. It is probable, however, that after yielding a limited amount of further ground the advance of the fly could be arrested in the more favourable country further east. No cases of sleeping sickness have occurred in any of the areas during the year. In the Melsetter district near the Portuguese border, the results have been reasonably satisfactory, and the clearing has been extended further southwards [*cf.* **23** 185]. As the comparatively few cases of trypanosomiasis that occurred behind the barrier might have been due to weaknesses in the clearing, it was widened at certain spots during

the year. If, however, a few flies [*G. pallidipes*, Aust.] present in Rhodesian territory have been cut off by the clearing, it is improbable that they will survive indefinitely. Where possible, the clearing was maintained by fierce grass fires; but where grass was scarce or poor, root growth was slashed back in the hope that the vigour of the roots would be lessened and that grass would gradually invade the deforested areas, thus rendering maintenance easier and less expensive. Experiments on the poisoning of the dominant trees of the natural forest have given promising results, although the final effect on the root system cannot yet be estimated. Details are given of the numbers of flies taken at the various traffic control stations from cars, cyclists and pedestrians.

The tick, *Rhipicentor nuttalli*, Cooper & Robinson, was found on a dog.

MACLEAN (G.). **Die Bekämpfung der *Rhodesiense*-Form der Schlafkrankheit in Tanganyika.** [The Control of the *rhodesiense* Form of Sleeping Sickness in Tanganyika.]—*Arch. Schiffs- u. Tropenhyg.* **39** no. 9 pp. 381–389, 1 map. Leipzig, September 1935.

This is a brief review of present knowledge regarding sleeping sickness caused by *Trypanosoma rhodesiense* in Tanganyika Territory and its transmission by *Glossina*.

THOMSEN (M.). **A Comparative Study of the Development of the Stomoxydinae (especially *Haematobia stimulans* Meigen) with Remarks on other Coprophagous Muscids.**—*Proc. zool. Soc.* 1935 pt. 3 pp. 531–550, 8 pls., 25 refs. London, September 1935.

The morphological characters of the egg, the three larval instars and the puparium of *Haematobia stimulans*, Mg., are described. Particular attention is given to the cephalo-pharyngeal skeleton of the larva, which is compared with those of *Stomoxys calcitrans*, L., *Lyperosia irritans*, L., *Musca domestica*, L., and *Calliphora erythrocephala*, Mg.

KUMM (H. W.), TURNER (T. B.) & PEAT (A. A.). **The Duration of Motility of the Spirochaetes of Yaws in a small West Indian Fly.—*Hippelates pallipes* Loew.**—*Amer. J. trop. Med.* **15** no. 2 pp. 209–223, 3 graphs, 4 refs. Baltimore, Md, March 1935. [Recd. November 1935.]

KUMM (H. W.). **The Digestive Mechanism of one of the West Indian "Eye Gnats," *Hippelates pallipes* Loew.**—*Ann. trop. Med. Parasit.* **29** no. 3 pp. 283–302, 2 pls., 3 figs., 6 refs. Liverpool, 5th October 1935.

The results of the observations and experiments described in detail in these two papers have already been noticed from a report on *Hippelates pallipes*, Lw., and its probable relation to the transmission of *Spirochaeta* (*Treponema*) *pertenuis* in Jamaica [*R.A.E.*, B **23** 274]. The first deals with the feeding habits of the flies and the methods of feeding, dissecting and examining them in experiments to determine the situation and longevity of the ingested spirochaetes. In the second, notes are also given on the feeding habits, and the anatomy of the digestive tract and the physiology of some of the digestive processes are described.

Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Species of the Genus *Glossina* Wiedemann based on a Comparative Study of the Male and Female Terminalia.**—*Ann. trop. Med. Parasit.* **29** no. 3 pp. 303–315, 9 figs., 2 refs. Liverpool, 5th October 1935.

In this paper, which is one of a series [*cf. R.A.E.*, B **23** 58], descriptions are given of the terminalia of both sexes and of the segmentation of the male abdomen of members of the genera *Hypoderma* and *Gastrophilus* as exemplified by *H. bovis*, DeG., and *G. intestinalis*, DeG. The systematic position of these genera is discussed.

Gibbins (E. G.). **On the Male Terminalia of Simuliidae.**—*Ann. trop. Med. Parasit.* **29** no. 3 pp. 317–325, 7 figs., 10 refs. Liverpool, 5th October 1935.

The significance of the male terminalia in the classification of *Simulium* has long been realised, but the uncertainty of the precise homologies of its complicated structures has led to much confusion in nomenclature. The present study, which is intended to serve as a basis for further work, was undertaken mainly in order that a definite and more accurate terminology might be adhered to. It is based on the examination of a large collection of specimens of *Simulium* from Uganda and consists mainly of a detailed description of the male terminalia of *S. nili*, Gibbins, with comparative notes on some other species.

Barber (M. A.) & Rice (J. B.). **Malaria Studies in Greece. The Malaria Infection Rate in Nature and in the Laboratory of certain Species of *Anopheles* of East Macedonia.**—*Ann. trop. Med. Parasit.* **29** no. 3 pp. 329–348, 5 refs. Liverpool, 5th October 1935.

A detailed account is given of studies carried out between April 1932 and December 1934 on the natural infection rate of Anophelines in a region of eastern Macedonia where malaria is endemic and on the susceptibility of the six local species to malaria infection in the laboratory.

The following is taken from the authors' summary : It appears that *Anopheles sacharovi*, Favr (*elutus*, Edw.) is the chief vector, and it was possibly the only important one in the region during the three years. *A. maculipennis*, Mg. (including both the typical form and var. *messeae*, Flni.) and *A. superpictus*, Grassi, were also found infected in nature, but the sporozoite rate of the first was very low and epidemiological evidence indicates that the second played an unimportant part in transmission, at least during the last two years. Both these species might be important vectors in localities with warmer climates or fewer domestic animals. During the three years the sporozoite rates in the three species of Anophelines and the parasite rates in the village populations both declined, apparently as a result of a lower rainfall, which affected especially the density of *A. sacharovi*. In laboratory experiments *A. superpictus* was somewhat more susceptible to infection with malaria parasites than *A. sacharovi* and *A. maculipennis*. *A. algeriensis*, Theo., and *A. claviger*, Mg. (*bifurcatus*, auct.) became infected with *Plasmodium falciparum*, but neither these nor *A. hyrcanus*, Pall., were found infected in nature. Precipitin tests showed that animal

deviation was far less marked in *A. sacharovi* than in any other species, the deviation in naturally infected and uninfected examples of this species being comparable. With regard to day-time resting places *A. sacharovi* is the most and *A. superpictus* the least likely to select houses. A summary is given of observations on parasites other than *Plasmodium* found in Anophelines.

BRADLEY (G. H.). **The Hatching of Eggs of the Southern Buffalo Gnat.**—*Science* **82** no. 2125 pp. 277–278, 3 refs. New York, 20th September 1935.

Continuing his investigations in the United States on *Simulium (Eusimulium) pecuarum*, Riley [*R.A.E.*, B **23** 184], the author obtained eggs in April 1934 by confining gravid females in jars over water. These eggs were placed in two jars, in one of which the water was kept agitated and aerated by a continuous stream of air produced by a suction pump and in the other left undisturbed. Up to 5th November no sign of larval development was visible in the eggs examined under low magnification, but in mid-December large numbers of eggs in both jars contained fully formed larvae and some in each were hatching. It is apparent, therefore, that the eggs will hatch after spending the summer in a quiescent stage and undergoing an incubation period of several months in either still or moving water. This offers an explanation for the fact that, in addition to the numbers of adults that emerge every spring from certain rivers, enormous numbers are produced during spring floods from the many "cutoffs" and lakes of the lowlands of Mississippi and Arkansas. The long incubation is apparently an adaptation for the period when the breeding places are likely to be unsuited for larval life. When these quiet waters are flooded, the larvae may develop more or less simultaneously and swarms of adults emerge, which, in favourable weather and migration conditions, may cause serious loss of farm animals.

VAN VOLKENBERG (H. L.). **Parasites and Parasitic Diseases of Horses in Puerto Rico.**—*Bull. P. R. [fed.] agric. Exp. Sta.* no. 37, 19 pp., 3 figs., 6 refs. Washington, D.C., August 1935.

In the course of this bulletin short notes are given on the bionomics and control of the following Arthropods that attack horses: *Dermacentor nitens*, Neum., *Stomoxys calcitrans*, L., *Lyperosia (Haematobia) irritans*, L., *Chrysops variegata*, DeG. (*costata*, F.), unnamed species of *Tabanus* and *Simulium*, *Gastrophilus nasalis*, L., *Cochliomyia hominivorax*, Coq., *Trombicula irritans* var. *tropica*, Ewing, and mange mites. *Hippelates* spp. cause some annoyance when abundant. *Onchocerca cervicalis* (neck threadworm), which seems to be scarce, has been shown to be carried by Ceratopogonids of the genus *Culicoides* [*cf. R.A.E.*, B **22** 58]; *C. furens*, Poey, is the most abundant species in Porto Rico.

GIRARD (G.). **Présence d'un bactériophage antipesteux chez la *Xenopsylla cheopis* au cours d'une petite épidémie de peste à Tananarive.**—*C. R. Soc. Biol.* **120** no. 31 pp. 333–334, 1 ref. Paris, 1935.

Following a small outbreak of bubonic plague (directly associated with an epizootic among rats) that occurred in the central section of Tananarive in April 1935, the author undertook investigations to

determine whether the rats of that section of the town harboured a bacteriophage. A lytic principle had previously been discovered in rats caught in another quarter of the town that had once been one of the chief foci of the disease. A lytic principle transmissible in series and as active as the previous one against all available strains of *Bacillus pestis* was obtained from the excreta of one out of four lots of rats. Experiments were then undertaken with five lots of fleas (*Xenopsylla cheopis*, Roths.) taken from rats in the same locality, and a bacteriophage as active as that from the rats was isolated in culture from the first lot, which consisted of 63 fleas. It lost none of its virulence in three months. In the culture of the last lot, which consisted of 45 fleas, there appeared to be the beginning of lysis, but this disappeared at the third passage. The three other lots, and two lots taken from rats trapped in sections of the town free from plague, gave negative results.

These findings may explain the discovery in several instances of infected fleas on rats that appeared to be healthy, since the rats might have harboured the bacteriophage and the fleas might have come from a rat that had died of plague. Inversely, it would presumably be possible to find normal fleas on infected rats. Only from investigations undertaken in a country free from plague will it be possible to determine whether the bacteriophage in the flea necessarily comes from the rat and whether it is associated with the incidence of plague in a given region.

GILLAIN (J.). **Note sur la présence d'***Aegyptianella pullorum* **chez les poules au Congo Belge.**—*Ann. Soc. belge Méd. trop.* **15** no. 3 pp. 299–300. Brussels, 30th September 1935.

Aegyptianella pullorum is recorded, for the first time from the Belgian Congo, in native fowls from the region of Nioka. As *Argas persicus*, Oken, is the vector [*cf. R.A.E.*, B **21** 266], care should be taken to avoid the introduction of infected birds into the flock and to destroy the ticks on the birds and in the places where they are kept.

PERGHER (J.) & CASIER (J.). **Le typhus exanthématique au Ruanda-Urundi.**—*Ann. Soc. belge Méd. trop.* **15** no. 3 pp. 305–347, 9 figs., 1 map, 4 refs. Brussels, 30th September 1935.

A detailed account is given of an outbreak of typhus in the Ruanda-Urundi District of the Belgian Congo that began in 1933. The population of the region is heavily infested with lice [*Pediculus*]. In the first hospital camps, instituted when the disease was thought to be influenza, the patients were admitted without previous destruction of their lice, and the longer the hospitals remained open the greater the mortality became. This was not the case in the hospital camps organised later, in which the ectoparasites of all patients were carefully removed. It was concluded that lice were the vectors for the following reasons: inoculation of infected lice into guineapigs produced the same symptoms as inoculation of blood from infected persons; uninfected lice fed on cases of the disease began to die about the 6th day, as in epidemic typhus, though the rate of mortality was not high even after 12 days; strains of the virus from man and lice showed complete cross immunity; and, in the case of an outbreak in a prison, the disease was eradicated

by the destruction of lice on all the inmates. The medical examiners could hardly have failed to contract the disease if fleas had been the vectors, since it was almost impossible to avoid becoming infested with them. The campaign, begun in May 1934, consisted in placing a sanitary cordon round the infected zone, and in isolating all cases in hospital camps where they were freed from lice and treated. These measures brought the epidemic to an end and may have completely eradicated the disease. Its disappearance proves that it did not exist in the area in an endemic form; moreover no immunity had been observed among the population. Serologically it more nearly resembled classical epidemic typhus than the form that is found in neighbouring countries, such as Uganda [*cf.* *R.A.E*, B **22** 83, 160].

WALKIERS (J.). **Contribution à l'étude des larves des stégomyias de Matadi et Thysville.**—*Ann. Soc. belge Méd. trop.* **15** no. 3 pp. 469–473, 3 figs. Brussels, 30th September 1935.

From 1931 to 1934 the author undertook a systematic study of the larvae of the species of *Aëdes* of the subgenus *Stegomyia* that occur at Matadi and Thysville in the Belgian Congo. Observations on several thousands of breeding places indicate that the females will oviposit in any collection of water, whether it is clear and running or foul and stagnant, and that the larvae develop equally well whether the reaction of the water is acid, alkaline or neutral. The characters distinguishing the three species, *A. aegypti*, L. (*fasciatus*, F.), *A. vittatus*, Big. (*sugens*, Theo.) and *A. simpsoni*, Theo., are described and illustrated. The two former are found everywhere, but adults of the latter are much less often taken in houses and its larvae are rare in breeding places in or near them.

SEN (P.). **An Instance of Species Anomaly amongst Anophelines.**—*Rec. Malar. Surv. India* **5** no. 3 pp. 207–209, 4 refs. Calcutta, September 1935.

The author records a case in which a female of *Anopheles vagus*, Dön., produced larvae of the types of *A. vagus* and *A. subpictus*, Grassi (*rossi*, Giles), and adults having the characters of these two species emerged in equal proportions [*cf.* *R.A.E.*, B **22** 188]. This result could be obtained, in the light of Mendelism, by the backcross of a hybrid to a double recessive. It renders doubtful the validity of specific distinction between these forms.

SEN (P.). **Some Peculiarities in the Breeding Habits of the Common** *Aëdes* (*Stegomyia*) **Mosquitoes of Calcutta.**—*Rec. Malar. Surv. India* **5** no. 3 pp. 211–212, 8 refs. Calcutta, September 1935.

The author records the finding in Calcutta of larvae of *Aëdes albopictus*, Skuse, which is believed to be a sylvan species that generally breeds in tree holes, in a broken glass jar and a metal drum, and of larvae of *A. aegypti*, L., which is essentially a domestic species that usually breeds in household receptacles, in water in a tree-hole [*cf.* *R.A.E.*, B **16** 70; **19** 119; **22** 172], and in the axils of the leaves of plants of the genus *Dressina*.

Ganguli (A. C.). **Observations on the Malaria-carrying Mosquitoes of Calcutta.**—*Rec. Malar. Surv. India* **5** no. 3 pp. 213–222, 2 charts, 2 maps, 11 refs. Calcutta, September 1935.

This account of the breeding places, seasonal prevalence and distribution of *Anopheles stephensi*, List. [*cf. R.A.E.*, B **18** 196; **20** 195; **23** 19], *A. sundaicus*, Rdnw., and *A. varuna*, Iyen., the only vectors of malaria in Calcutta, is based on observations made between 1st August 1933 and 31st July 1934 on larvae and adult mosquitos collected daily throughout the municipal area. The situation of the City, its climate, water supply and drainage are briefly discussed, and the possible importance of its numerous means of transport in bringing in mosquitos from surrounding malarious districts is pointed out. *A. stephensi* is most prevalent during the rainy season, but the amount of breeding depends not on the amount of rainfall but on the number of rainy days in a month. *A. sundaicus*, which is found on the eastern border of the City, near Salt Lakes [*cf.* **20** 195], breeds chiefly in reservoirs; it was responsible for an outbreak of malaria in that district in 1929. *A. varuna* is confined to the southern and south-eastern parts of the City, where it breeds mainly in reservoirs with marginal vegetation.

Puri (I. M.). **Schematic Table for the Identification of the Indian Anopheline Mosquitoes. Part I. Adults. Part II. Full-grown Larvae.**—*Rec. Malar. Surv. India.* **5** no. 3 pp. 265–273, 2 fldg charts, 4 refs. Calcutta, September 1935.

Following Treillard's principle of giving schematic representations of the different important diagnostic characters [*R.A.E.*, B **23** 35, 101], the author evolved concise tables for the identification of the adults and the full-grown larvae of the Indian species of *Anopheles*. The tables are chiefly for the use of workers in the field, to supplement the keys already published [**15** 144; **23** 271]. The diagnostic characters used are discussed, and some of the more important variations that might cause confusion in identification are briefly mentioned.

Sinton (J. A.) & Wats (R. C.). **The Efficacy of various Insecticidal Sprays in the Destruction of Adult Mosquitoes.**—*Rec. Malar. Surv. India* **5** no. 3 pp. 275–306, 1 fig., 2 charts, 23 refs. Calcutta, September 1935.

The literature on the use of sprays (particularly those containing pyrethrum) against household insects is briefly reviewed, and the properties required in a spray against mosquitos, the uses and advantages of pyrethrum sprays and the factors that may influence their efficacy, and the methods hitherto recommended for testing the toxicity of sprays are discussed.

Details are given of the apparatus and technique used in experiments in the Punjab to test various locally prepared sprays and 15 proprietary ones against mosquitos in a chamber with a capacity of 45 cu. ft. Since insects may be killed by drenching them with solutions of low insecticidal value and mosquitos may hide in positions where a spray cannot be applied to them directly, the "direct-hit" effect was eliminated by placing the mosquitos in the chamber after spraying.

Anopheles annularis, Wulp, and *A. subpictus*, Grassi, were used in some of the experiments but the former only in the more detailed critical tests. In each case 25 females were exposed for 30 minutes, their state was then recorded, they were subsequently kept under the same conditions as the control batch of mosquitos, and the final results were determined at the end of 24 hours. The amount of each solution used was 0·2 cc. diluted to 1 cc. with kerosene, which by itself had been found to produce no appreciable lethal effect in 30 minutes.

None of the locally prepared sprays that contained no pyrethrum gave satisfactory results. Of the proprietary brands only two gave an average mortality of over 90 per cent. and the toxicity of many of the others was low. A solution consisting of 1 part of a standardised concentrated extract of pyrethrum flowers (Pyrocide 20) in 19 parts refined kerosene gave results approximately equal to those of the best proprietary brands at about half the cost. In 76 controlled experiments under varying conditions of temperature and humidity, the average mortality was 93·8 per cent. ; in 55 of these it was more than 95 per cent. and in only 5 was it below 80. Temperature and humidity had a distinct influence on the lethal effect, toxicity rising with the temperature and decreasing as the humidity rose.

In trials to determine whether this pyrethrum-oil solution would prove equally effective in houses, mosquitos were enclosed in small mosquito netting cages suspended at different levels in a room that had just been sprayed. In nine tests in which the rate of application varied from 1 cc. per 112 cu. ft. to 1 cc. per 390 cu. ft. and the time of exposure ranged from 10 to 30 minutes, the average mortality was 96·8 per cent., as compared with 62·8 per cent. in a single test with one of the well-known proprietary insecticides at 1 cc. per 187 cu. ft. for 15 minutes. The findings after 24 hours suggest that a higher final lethal effect is produced by a greater quantity of spray acting over a shorter period than by a proportionately smaller one acting for a longer time. In the nine tests mentioned the average mortality was 93·3 per cent. at ceiling level, 97·5 near the floor and 98 in the two intermediate positions, one-third and two-thirds of the distance between the floor and ceiling. The less efficient action in the upper parts of the room is probably due to a rapid settling of the cloud of spray. There may also be a distinct diminution in toxicity at positions in a room where the cloud is liable to dilution or diffusion. The extent to which this pyrethrum-oil solution fulfils the requirements outlined at the beginning of the report is discussed. It is harmless to man, can be applied by a hand sprayer, and gives good results even when no elaborate precautions are taken to seal rooms. It would probably be improved by the addition of oil of citronella (5 per cent.), oil of sassafras ($\frac{1}{2}$–1 per cent.) or oil of pine (4–5 per cent.), since these would not only mask the odour of kerosene, but would also possibly increase the efficacy of the spray and give it a repellent action. Further tests must be made to determine its value under natural conditions and against other species of mosquitos.

Mulligan (H. W.). **Some Notes on Malaria in Baluchistan.**—*Rec. Malar. Surv. India* **5** no. 3 pp. 339–343. Calcutta, September 1935.

This paper consists of abstracts of three reports. In the first, which deals with a malaria survey in Quetta in May 1935, it is stated that

malaria is a serious menace to the community. The most prevalent Anophelines appeared to be *Anopheles culicifacies*, Giles, *A. stephensi*, List., and *A. superpictus*, Grassi, all of which are dangerous vectors in other localities. Breeding places included springs and seepages, river beds, irrigation channels and overflows from them, wells, reservoirs, etc. In the second, suggestions are made for the prevention and control of malaria in Quetta under conditions that are likely to prevail after the devastating earthquake that occurred immediately after the conclusion of the survey. These include the selection of a healthy site for the refugee camp, the treatment of all water within half a mile of the camp with Paris green, the destruction of adult mosquitos that usually collect in large numbers under the roofs of tents in the early morning by means of a spray (kerosene containing Pyrocide 20 [see preceding paper] being recommended), and the distribution of quinine or cinchona febrifuge. The desirability of carrying out a proper malaria survey prior to any work of reconstruction is emphasised.

The third report deals with the important military station of Fort Sandeman, which is one of the most malarious in India. The impression gained during a brief visit was that much of the malaria was due to uncontrolled irrigation in the vicinity of barracks. Overgrown irrigation channels, over-irrigated lands, and seepages and leaks from faulty channels are abundant and form ideal breeding places for malaria-carrying Anophelines. Thus the solution of part of the malaria problem would appear to lie in the rigid control of the amount and method of supply of irrigation water. The attempts being made to provide a reserve water supply by wells within the military area are likely to be followed by an increased distribution of water and consequently by the formation of additional breeding places. The author recommends that the smallest possible number needed for emergencies should be sunk, and that their working under ordinary conditions be reduced to the minimum necessary to keep them in good condition.

Gupta (P.), Bhattacharya (S. R.) & Datta (N. C.). **Malaria Survey Report on Nijpat Jaintiapur, Sylhet District, Assam.**—*Rec. Malar. Surv. India* **5** no. 3 pp. 335–336. Calcutta, September 1935. **Malaria Survey Report of Sylhet Town, Sylhet District, Assam.**—*T.c.* pp. 337–338.

In these abstracts of survey reports, the numbers of Anophelines dissected are given. The only species found infected with malarial parasites was *Anopheles minimus*, Theo.; of 205 examples dissected at Nijpat Jaintiapur 3 showed oöcysts and 5 sporozoites, and of 52 dissected at Sylhet Town 1 showed sporozoites. The institution of extensive anti-larval measures is not recommended, as the vector or vectors of malaria have not yet been definitely determined.

Magoon (E. H.). **A portable Stable Trap for capturing Mosquitos.**—*Bull. ent. Res.* **26** pt. 3 pp. 363–371, 1 pl., 2 figs. London, September 1935.

Details are given for the construction and operation of a portable mosquito trap, as used in Jamaica, in which a live animal, such as a donkey, serves as bait.

Weyer (F.). **Die Variabilität der Grösse bei den Rassen von *Anopheles maculipennis* unter natürlichen Bedingungen und im Experiment.** [The Variation in Size in Races of *A. maculipennis* under natural and experimental Conditions.]—*Arch. Schiffs- u. Tropenhyg.* **39** no. 10 pp. 399–408, 14 refs. Leipzig, October 1935.

Owing to its variability, size has been superseded by egg characters as a means for differentiating races of *Anopheles maculipennis*, Mg., but it may be of practical value where eggs are not available. The influence of temperature has been regarded by the author as primarily responsible for differences in size between the summer and winter generations of a given race in the same place [*R.A.E.*, B **21** 234, 259]. If this be correct and can be applied to the average size of each race, it should be capable of proof, firstly by measurements of a given race in one place at various seasons of the year or during several years, secondly by measurements of a given race from districts wide apart geographically, and thirdly by experimental methods.

The author has investigated var. *messeae*, Flni., and var. *atroparvus*, van Thiel, along all three lines and comes to the following conclusions. A slight hereditary size-difference between *messeae* and *atroparvus* is apparent, but cannot be used for differentiation. External influences (climate and larval nutrition) cause a difference in the average size of the same race (particularly in *atroparvus*) that is greater than the hereditary difference between the races.

The larger size of mosquitos that have developed in cold breeding water is shown in nature in the variation of average size in the same place at various seasons and in various years. This is also shown by the same race from different regions. The races are on an average larger in Denmark and North Germany than in Italy or Rumania. Average size was also altered experimentally by external conditions. The mosquitos from one batch of eggs were larger if bred in cold than if bred in warm water, and badly fed larvae produced smaller adults than well-fed ones. These results applied to both races.

These facts should explain the difference in average size of individuals of a given race observed in nature. It remains to be explained why *messeae*, at least in Germany and in investigations made hitherto, displays a relative constancy in size.

Achundow (J.). **Die Entdeckung des *Anopheles bifurcatus* Linné 1758 auf der Halbinsel Apscheron.** [The Discovery of *A. claviger*, Mg., in the Peninsula of Apsheron.]—*Arch. Schiffs- u. Tropenhyg.* **39** no. 10 pp. 409–412, 2 figs., 3 refs. Leipzig, October 1935.

Until water was brought for over 100 miles to Baku, much of the water supply of the Apsheron peninsula was obtained from over 3,000 wells, including some hundreds provided with both the ordinary vertical shaft and a sloping one for a stairway leading down to the water-level. In some of these, larvae and adults of *Anopheles claviger*, Mg. (*bifurcatus*, auct.), which had not previously been recorded from the peninsula, were found in May 1934. Others harboured *Theobaldia annulata*, Schr., and *Culex pipiens*, L. The waters had a high salt-content, but only that from the wells with *Theobaldia* and *Culex* was readily oxidised. *A. claviger* was subsequently found in ordinary wells, in some villages and at Baku. Other mosquitos taken at Baku were *A. maculipennis*, Mg., one individual of *A. pseudopictus*, Grassi, *T. annulata*, *T. longiareolata*, Macq. (*spathipalpis*, Rond.), *C. pipiens* and *Aëdes aegypti*,

L. (*Stegomyia fasciata*, F.). Cases of malaria were numerous, including many in persons who had never left Baku. The chief agent was *Plasmodium vivax*.

Lloyd (Ll.). **Prevention of Clogging of Strainers in rearing Aquatic Organisms.**—*Nature* **136** p. 646, 1 ref. London, 19th October 1935.

The author describes an apparatus for use in rearing larvae (such as those of *Metriocnemus longitarsus*, Goet. [*cf. R.A.E.*, A **23** 239]) in flowing water, in which clogging of the strainer on the outlet pipe with algal food and excreta is prevented by adjusting the drops from the inlet pipe so that each wave makes contact with the outlet pipe and ejects an equal amount of water and the suction exerted by the falling wave keeps the strainer from clogging. The drip in the author's experiments was adjusted to renew the water in the flask every four hours, but a faster renewal is possible so long as the "make and break" system persists.

Goetghebuer (M.). **Note à propos des Ceratopogonidae (Dipt. Némat.).**—*Bull. Soc. ent. Belg.* **75** no. 8 pp. 309–311, 5 refs. Brussels, 30th August 1935.

The author suggests that too little attention has been paid to the genus as a means of determining what species of Ceratopogonids are likely to attack man or other vertebrates. The females of nearly all the species are biting insects, many of them attacking other insects, whereas the males feed on the juices of flowers or plants. From an examination of the records, the author concludes that all the species that attack man and other vertebrates in Europe and Algeria belong to the genera *Culicoides* or *Leptoconops*. He considers Brumpt's assertion that *Dasyhelea dufouri*, Laboulb., bites man to be incorrect, as he himself has been unsuccessful in his attempts to induce closely allied species of this genus to bite man. Although it has been stated that Ceratopogonids are diurnal feeders, the author has observed *Culicoides impunctatus*, Goetgh., which is abundant near certain turf pits in Belgium, to attack man at night as well as in the daytime.

Cameron (A. E.). **Insect Pests of 1934.**—*Trans. Highl. agric. Soc. Scot.* 1935 reprint 26 pp., 15 figs., 15 refs. Edinburgh, 1935.

The first part of this report consists of a short account of the author's investigations, begun in 1930, on British Tabanids, as exemplified by *Haematopota pluvialis*, L. The morphology and bionomics of this fly are described [*cf. R.A.E.*, B **18** 272 ; **22** 232], and data on its control are discussed. Owing to its obscure breeding habits and the subterranean dispersal of its larvae and pupae, the application of insecticides would probably be of little value. Drainage and reclamation of waste, water-logged land are undoubtedly the surest means of eradicating the fly, but such measures are not usually economically practicable. Little is known of its natural enemies, but the habit of cannibalism among its larvae is believed to be the most important single factor limiting its numbers. The adults avoid shade ; they do not, therefore, readily enter barns and stables. Thus access to a suitable shelter would enable pastured animals to rid themselves of the flies.

ROBINSON (W.). **Allantoin, a Constituent of Maggot Excretions, stimulates healing of chronic discharging Wounds.**—*J. Parasit.* **21** no. 5 pp. 354–358, 10 refs. Baltimore, Md, October 1935.

The following is substantially the author's summary : An investigation of the unusually rapid healing of wounds treated with blowfly maggots has been made, and a substance has been isolated from maggot excretions that has the property of stimulating healing in infected wounds. It has been identified as allantoin, a product of metabolism of the cell nucleus of both plants and animals. The excretion of this substance into the wound is apparently one of the factors contributing to the remarkable healing effects obtained in maggot therapy ; but the claim is not made that allantoin can be entirely substituted for the use of maggots. Allantoin is of common occurrence and can be obtained commercially. It is harmless and soothing and has no odour or taste. Treatment of wounds with this material is simple, painless and inexpensive. A method of preparing allantoin solution and of using it is described.

GOFFE (E. R.). **Male Tabanidae (Dipt.) in the New Forest, Hants, 1934–35.**—*J. Soc. Brit. Ent.* **1** pt. 4 pp. 100–109, 10 refs. Southampton, 28th October 1935.

The author records in detail observations made in Hampshire during 1933 and 1934 on the habit of drinking while flying over water in males of a number of species of Tabanids, and gives notes on their variation and synonymy in some cases.

IRVING (W. G.) & HINMAN (E. H.). **The Blue Mud-dauber as a Predator of the Black Widow Spider.**—*Science* **82** no. 2130 pp. 395–396. New York, 25th October 1935.

An examination of the nests of the 3 mud-daubers that occur in New Orleans, *Sceliphron coeruleum*, L. (*Chalybion cyaneum*, Klug), *S. caementarium*, Drury, and *Trypoxylon texense*, Saus., showed the contents to consist of various spiders stored as food for the larvae. Varying numbers, with an average of 19, of *Latrodectus mactans*, F., were found in each of the 15 nests of *S. coeruleum* examined, but none in those of *S. caementarium*.

PAPERS NOTICED BY TITLE ONLY.

WALCH (E. W.) & WALCH-SORGDRAGER (G. B.). **De eieren van eenige Anophelinen in Ned.-Indië.** [The Eggs of some Anophelines in the Netherlands Indies.]—*Geneesk. Tijdschr. Ned.-Ind.* **75** no. 20 pp. 1700–1730, 6 pls. Batavia, 1st October 1935. [For a condensed English version see *R.A.E.*, B **23** 233.]

MARTINI [E.]. **Ceylon-Malaria.** [*Anopheles culicifacies*, Giles, the chief vector.]—*Anz. Schädlingsk.* **11** no. 9 pp. 103–105. Berlin, September 1935. [*Cf. R.A.E.*, B **23** 61, 251.]

GASCHEN (H.). **Description d'un nouvel *Aëdes* du Yunnan, *Finlaya yunnanensis* sp. n.**—*Arch. Inst. Pasteur Indochine* no. 19 pp. 331–335, 3 pls. (1 col.), 5 refs. Saigon, April 1934. [Recd. September 1934.]

Principaux travaux d'entomologie médicale en Indochine de 1900–1935 (sauf les travaux concernant les anophèles et le paludisme qui font l'objet d'une bibliographie spéciale).—*Arch. Inst. Pasteur Indochine* no. 19 pp. 371–375. Saigon, April 1934. [Recd. September 1935.]

Swellengrebel (N. H.). **The Basis of Malaria Control by Anti-Larval Measures in the Netherlands** [a review of malaria research work in Holland from 1919 to the present day].—*Malay. med. J.* **10** no. 3 pp. 61–66. Singapore, September 1935.

Bragina (A.). **Ueber Jugendstadien einiger mazedonischen Culiciden.** [On the immature Stages of some Macedonian Culicines.]—*Glasn. tzentr. khig. Zavoda* **10** no. 2 pp. 22–40, 41 figs., 10 refs. Belgrade, 1935.

Li (Feng-swen) & Wu (Shih-cheng). **A List of Mosquitos collected in a few famous Localities of Chekiang and Anhwei.**—*Ent. & Phytopath.* **3** no. 26 pp. 522–525. Hangchow, 11th September 1935.

Mellanby (H.). **The early embryonic Development of** *Rhodnius prolixus* (**Hemiptera, Heteroptera**).—*Quart. J. micr. Sci.* (N.S.) **78** no. 1 pp. 71–90, 1 pl., 11 figs., 21 refs. London, October 1935.

Thompson (G. B.). **The Parasites of British Birds and Mammals. IV. Records of Mammal Parasites.**—*Ent. mon. Mag.* **71** nos. 856–857 pp. 214–219, 5 refs. London, September & October 1935.

Roberts (F. H. S.). **A Check List** [annotated] **of the Arthropod Parasites of domesticated Animals in Queensland.**—*Aust. vet. J.* **11** no. 1 pp. 2–10, 31 refs. Sydney, February 1935.

Minning (W.). **Zur Kenntnis des Genus** *Boophilus* **Curtice, i.** [Contribution to a Knowledge of the Genus *Boophilus*; *B. calcaratus* subsp. *hispanicus*, n., from Spain.]—*Z. Parasitenk.* **7** no. 6 pp. 719–721, 2 figs., 1 ref. Berlin, 11th September 1935.

Wagner (J.). **Die Veränderungen des Mitteldarmes und die Regeneration seines Epithels beim Menschenfloh während der Metamorphose.** [Alterations in the Mid-gut and Regeneration of its Epithelium in *Pulex irritans*, L., during Metamorphosis.]—*Zool. Jb.* (Anat.) **60** no. 2 pp. 263–288, 2 pls., 3 figs., 1 ref. Jena, 15th October 1935.

Matheson (R.). **Three new Species of Ticks,** *Ornithodorus* (**Acarina, Ixodoidea**) [from bats in Panama].—*J. Parasit.* **21** no. 5 pp. 347–353, 1 pl., 7 figs. Baltimore, Md, October 1935.

Jellison (W. L.). **A new Species of** *Bovicola* (**Mallophaga**) [*B. americanum*, sp. n., on wapiti (*Cervus canadensis*) in the United States].—*J. Parasit.* **21** no. 5 pp. 410–411, 4 figs. Baltimore, Md, October 1935.

Ancona H. (L.). **Contribución al conocimiento de los piojos de los animales de México. III.** *Goniocotes hologaster* **Nitzsch.** [A Contribution to the Knowledge of the Lice infesting Animals in Mexico. III. *G. gallinae*, Retz. (*hologaster*, Nitzsch) on fowls; a morphological study.]—*An. Inst. Biol. Univ. Mex.* **6** no. 2 pp. 119–128, 8 figs., 8 refs. Mexico, D.F., 1935. (With a Summary in English.)

Marotel (—). **Nomenclature et classification des piroplasmes.**—*Rev. vét.* **87** pp. 537–540. Toulouse, September 1935.

Hartung (E.). **Untersuchungen über die Geruchsorientierung bei** *Calliphora erythrocephala*. [Investigations on the Olfactory Orientation of *C. erythrocephala*, Mg.]—*Z. vergl. Physiol.* **22** no. 2 pp. 119–144, 6 figs., 1 p. refs. Berlin, 13th June 1935.

Hobson (R. P.). **On a Fat-soluble Growth Factor required by Blow-fly Larvae** [*Lucilia sericata*, Mg.]. **II. Identity of the Growth Factor with Cholesterol.**—*Biochem. J.* **29** no. 9 pp. 2023–2026. Cambridge, 1935. [*Cf. R.A.E.*, B **23** 248.]

Kröber (O.). **Eine neue deutsche Tabanide.** [A new German Tabanid (*Sziladynus calluneticola*, sp. n.)].—*Verh. Ver. naturw. Heimatforsch. Hamburg* **24** pp. 159–160. Hamburg, 1935.

Nieschulz (O.). **Ueber zwei** *Trypanosoma*-**ähnliche Flagellaten aus** *Fannia canicularis*. [On two trypanosome-like Flagellates from *F. canicularis*, L., in Utrecht. *Rhynchoidomonas fanniae*, sp. n., and *R. trajecti*, sp. n.]—*Arch. Protistenk.* **85** no. 3 pp. 416–420, 23 figs., 4 refs. Jena, 23rd October 1935.

Ramsay (J. A.) **Methods of measuring the Evaporation of Water from Animals.**—*J. exp. Biol.* **12** no. 4 pp. 355–372, 5 figs., 18 refs. London, October 1935.

Ramsay (J. A.). **The Evaporation of Water from the Cockroach.**—*J. exp. Biol.* **12** no. 4 pp. 373–383, 10 graphs, 6 refs. London, October 1935.

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GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets, it signifies that the name is not the one adopted.

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* For relation to disease see under Anaplasmosis, Dengue, Encephalomyelitis (equine), Filariasis, Fowl-pox, Horse-sickness, Malaria, Steptococcal Infections, Three-day Fever, Tularaemia, Yellow Fever.

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